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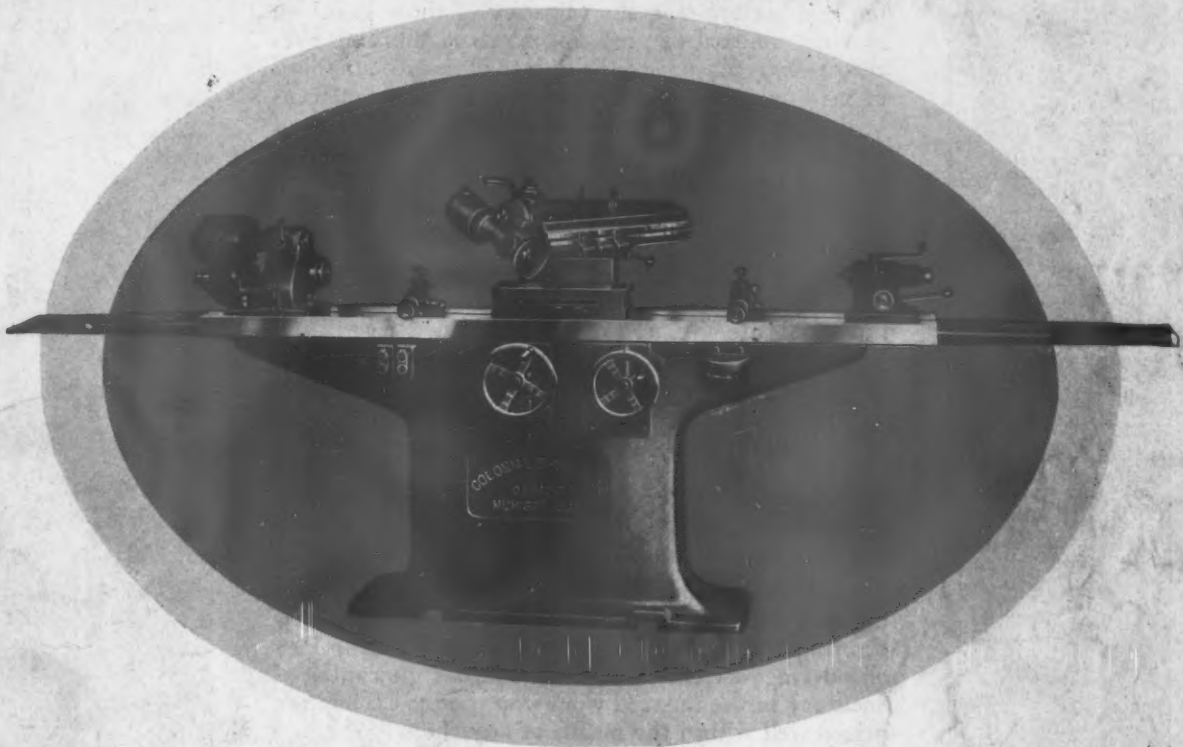
The
TOOL ENGINEER

First Copy

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DEC 8 - 1937

DETROIT



"Universal" Broach Sharpener for both flat and round broaches
just announced by Colonial Broach Company.
See story on page 24.

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Milling Cutter Teeth
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Effect of Industrial
Design on Machines
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DECEMBER
1937

Official Publication of the
**AMERICAN SOCIETY
OF TOOL ENGINEERS**

Your plant needs this Master Accuracy

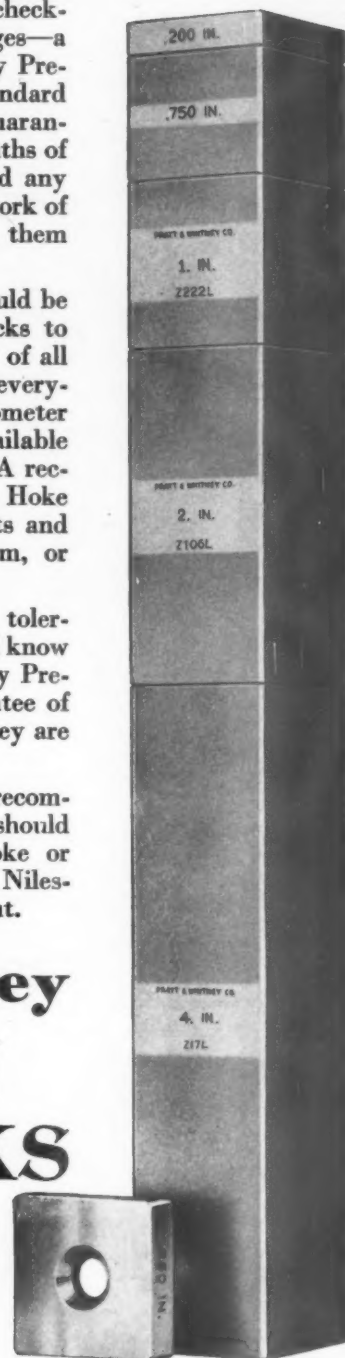
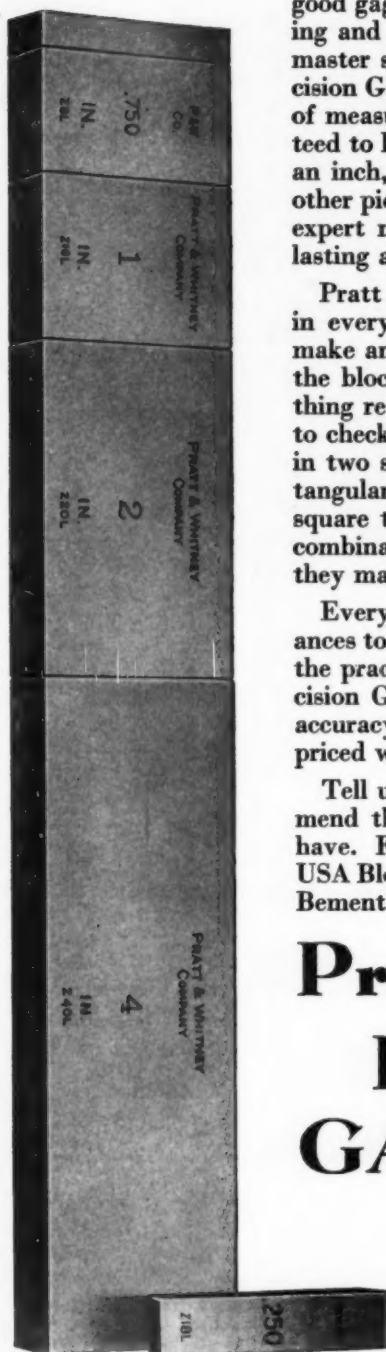
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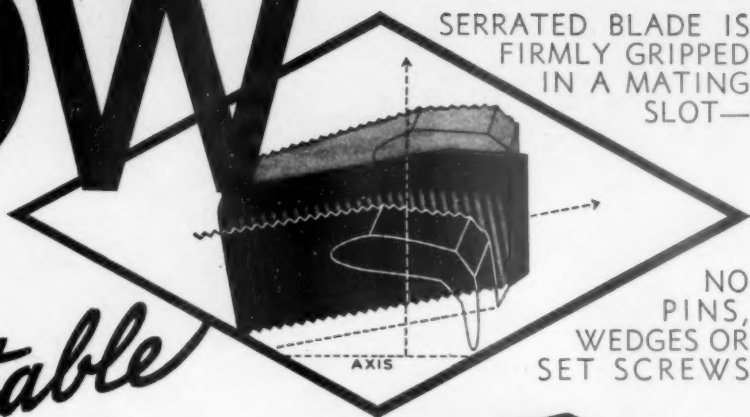


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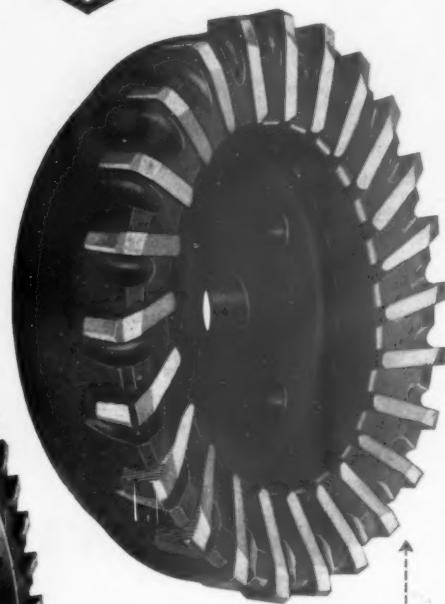
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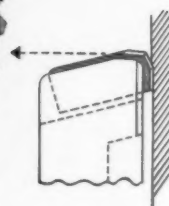
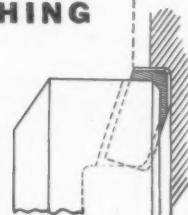
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December 1, 1937

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The year through, and especially at this season, we are grateful for the friendships which business makes possible.

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It has been a great satisfaction to do business for so many years with our valued clients, and we know that the years to come will bring a continuance and an increase of that satisfaction.

So, a very Merry Christmas to you and sincere wishes for the best of everything during 1938.

Sincerely yours,

Roy P. Mitchell

General Manager

RGM:JH

The Tool Engineer

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Official Publication of the AMERICAN SOCIETY OF TOOL ENGINEERS

Vol. VI

DECEMBER, 1937

No. 8

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Owing to the nature of the American Society of Tool Engineers, a technical organization, it cannot, nor can the publishers be responsible for statements appearing in this publication either as papers presented at its meetings or the discussion of such papers printed herein.

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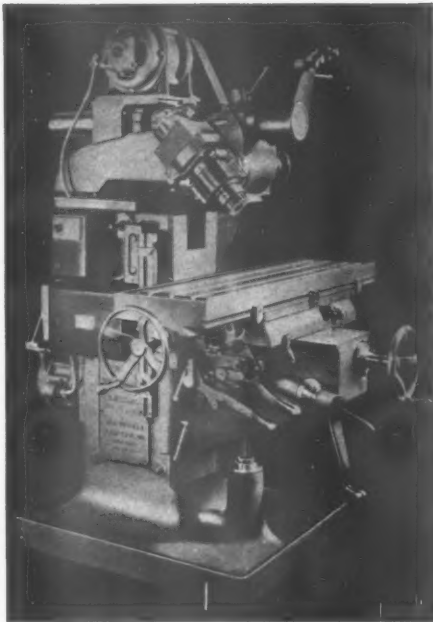
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THE TOOL ENGINEER FOR DECEMBER, 1937

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machine time ordinarily spent in resetting toolroom milling jobs. Set the job up *once* on a Van Norman Universal Miller—and let it stand until completed. To change from one operation to another, simply loosen three bolts, swivel the cutterhead to the new position, start the cut. To mill

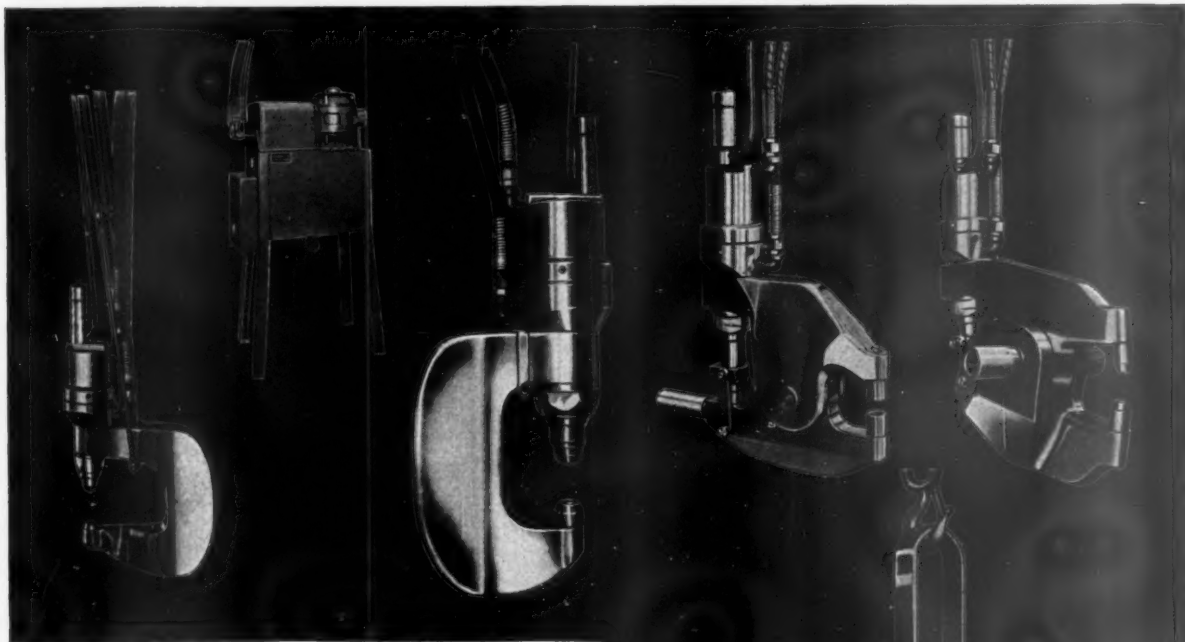
the other side of the piece, loosen two clamps, slide the ram. In this way you will eliminate errors, put hours of unproductive time back to work. If you handle a wide variety of work requiring many operations, it will be definitely worth your while to get the whole story on Van Norman Universal Millers. Get a line in the mail today.

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EDITORIAL

By A. E. Rylander

THE slogan made famous by Dodge of a past vintage sold cars, as retention of characteristic lines by Packard and Rolls-Royce give a certain security to owners of those cars. A prospect may buy either knowing that its styling will not be obsolete by the time the final note is paid, assuming that buying is on time. Most of it is, these days.

The foregoing is analogous, not essentially pertinent to the topic. For constant improvement rather than radical departure applies to tool and machine design, especially as these relate to automotive production. For example, a radically new automobile necessitates an entire change of tooling, often of equipment, the whole running into vast sums when spread over the industry. While this is progress to the Nth degree, it is possible that progress would be accelerated and employment (closely correlated to the market) considerably stabilized if changes followed in orderly sequence rather than as a yearly exploit.

True, changes are projected ahead; the '38 model was conceived several years back and it took considerable engineering and testing to evolve it. But, it was released for tooling and processing so close to the deadline that design for tools and purchase of equipment (which must also be designed) was simply a repetition of the seasonal frenzy that is at once the bane of the conservative and the delight of the man with ideas.

Striking a middle course between extremes, however, it seems entirely reasonable that the time to prepare for production of '39 models is now. By releasing tentative designs of various units these could be considered for possible interferences and the best methods of production at a time when Tool Engineers and designers have time to think. Also, it would anticipate tooling programs, thus levelling off employment of tool and die makers. Eventually this will come to pass; when it does, we shall have resolved a seasonal madness to a year 'round sanity. Let us speed "the day."

A Progressive Step

Midland Steel Products Corp., makers of automobile frames and other steel products, is disposing designers and draftsmen throughout the plant during a lull in engineering programs. While this has long been customary in eastern plants, Detroit has been slow to adopt the idea. But now, due to the foresight of an intelligent management, trained men will not only be available when needed, but will go back to their boards with a keener concept of their jobs. For, the designer who has to handle tools and equipment in the plant will be critical, will be the better qualified to improve tooling methods. The advantage of shop training has long been stressed as one of the qualifications of the Tool Engineer; now, Midland not only fosters that practice but trains men for future key positions. Let the idea spread.

Letters

Williams Oil-O-Matic Heating Corporation
General Offices and Factory
Bloomington, Illinois, U.S.A.

American Society of Tool Engineers
2842 West Grand Boulevard
Detroit, Michigan.
Gentlemen:

I have just finished reading a copy of your magazine "The Tool Engineer" and find it most interesting. I am wondering whether or not I may be eligible for admission to your "Society."

I am not a tool engineer but am very closely connected to the production end of engineering, since I am a time study engineer at this plant.

I would appreciate hearing from you in regard to making application for membership in the A.S.T.E.

Sincerely yours,

J. M.
Bloomington, Ill.

From information sent to you, you can easily determine your membership grade and qualifications. We will welcome your application.—Editor.

▼ ▼ ▼
War Department
Pittsburgh Ordnance District
Pittsburgh, Pa.

Bramson Publishing Company
Detroit, Michigan
Gentlemen:

This office has been advised that you publish the magazine "The Tool Engineer."

Will you kindly forward a sample copy and advise as to the subscription price, etc.

Very truly yours,

H. C. M.
Major, Ord. Dept., U.S.A.

A copy of this issue has been sent you. This publication is not sold on subscription. We suggest you affiliate with A.S.T.E. and enjoy all its advantages as well as this publication.—Editor.

▼ ▼ ▼
Remington Rand Inc.
Middletown, Conn.

The Tool Engineer
2842 West Grand Boulevard
Detroit, Mich.
Gentlemen:

I am desirous of becoming a member of the American Society of Tool Engineers and would therefore appreciate your sending me information pertaining to membership in the society.

Thank you. Very truly yours,
W. T. B.

Full details of membership have been sent you. You undoubtedly will enjoy affiliation with either Hartford or Bridgeport Chapters—contact the Secretaries of either chapter.—Editor.

▼ ▼ ▼
Sunbeam Electric Manufacturing Co.
Evansville, Indiana, U.S.A.

The Tool Engineer
2842 West Grand Boulevard
Detroit, Mich.
Gentlemen:

Please mail information pertaining to membership in American Society of Tool Engineers.

Yours very truly,
C. J. R.

Machinery & Equipment Engineer

Complete information has been sent to you. If you are interested, perhaps you would like to assist with organizing an Evansville Chapter of A.S.T.E. Write us for details.—Editor.

MODERN TIME STUDY

Part I

By

F. W. Shumard

Founder

National School of Time Study
Norwalk, Conn.

WHEN ONE OR MORE individuals decide to embark upon the seas of manufacture to market, in large volume, some product where keen competition prevails, the success of the enterprise involves many considerations.

The product to be made may call for the use of special buildings whose length, width, height and general floor space areas must be especially prepared for low manufacturing costs. These buildings, when completed, are filled with materials, machinery, men and incidental equipment—all of which require the services of many different specialists before and after actual shipments of the product are made.

Who are these specialists? Perhaps the first in the group are the bankers, lawyers and promoters who pave the way. Following them are the architects; builders; product design men; chemists; process, layout, production, plant engineers; draftsmen; tool designers; management officials; foremen; accountants; material suppliers; purchasing agents; employment men; machine tool makers; and others who directly or indirectly contribute to the ultimate success of the business venture. Each of these experts must know his job well.

What is the desired result of the joint work of these experts? It is the ability to ship a quality product in large volume and to enjoy an attractive profit margin. Plant activities, shipments and profits can be reduced to one word; to a common denominator which underlies all manufacture, and that word is Time. Business cycles and all they imply are constantly changing, but time remains as a positive, basic factor from which all things are projected. Thus, the integrated activities of all of the experts mentioned have as a genesis, the element of time. If they have done their work well, the time element, when converted to costs and profits, will be a step nearer the utopian manufacturing goal sought by the personnel.

The Time Study Man

It is the time study man who is given the task of interpreting and establishing a time element made up of many sub-totals. He is, perhaps, one of the last men called into

play. His brains are not a composite of all the individuals I have previously mentioned, but his findings do represent the result of all the preparation work thought to be the best by the experts preceding him. Materials, machinery, methods and men are supposed to be in readiness before his services are requested. The time study man evaluates, by time measurement, all phases of manufacturing processes and arrives at a time index for each. Truly his work is important when viewed in the light of all circumstances, because a time study actually becomes a focal point from which all activities radiate and to which money values are attached.

Not many years ago when competition was not so keen and profit margins were long, certain latitudes could be tolerated in setting up time elements. At that time, such work was done by the foreman of a department. His usual method was to dump a box of unfinished work in front of a bench or machine, assign an alleged fast, expert workman to it and warn the demonstrator to "step on it." Before taking his departure, the foreman would note the time the job was started as indicated by the nearby clock on the wall, and after making a few subsequent visits to the scene of action, he would finally return when the job was done and again look at the clock to determine the elapsed time. Afterward, at his desk, the foreman, by means far from scientific, would arrive at a piece work price which might not be correct. If he cut the time too much, the resultant howl from the operators would cause the foreman to loosen up the rate somewhat. If the rate proved to be loose and the operators did not violate it, the rate might stand for years without alteration.

Let me say, in passing, that one way of determining loose time allowances without entering a manufacturing department, is to look over the performance records of operators on individual operations. As we well know, if weather, material, ma-

chinery and methods are not the same each day, a fluctuation of output will be noticed if the operation in question is very sensitive to such variables. These fluctuating conditions should cause variations in the daily wages of the operator and will if the rate is not loose. However, if an analyst, in looking over payroll records, sees that some given operation reflects unvarying wage payments despite erratic operating conditions, he can well believe that the rate is loose when nothing short of a cyclone will disturb it.

In hundreds of plants today the foreman still sets the rates by old fashioned methods. Perhaps a wrist time piece, or a stop watch has replaced the clock on the wall and perhaps a man known as a rate setter has relieved the foreman of the job of timing the operations, but otherwise the procedure of setting up piece work rates has not changed materially. If a company in these days where the tempo of business grows faster and faster, can make money in spite of its ignorance of modern time study procedure, or has indulgence for improper time measurement methods, it must have a long profit margin in order to exist. It can't exist for long, because competitors are attracted to such profitable products as quickly as bees to flowers.

The Job

Modern time study has become a science and persons engaged in it must be as thoroughly qualified for it as for any other branch of engineering. Besides his ability to compile accurate Standards, the time study man must know how to sell and keep sold his findings to both labor and management. He must know human engineering; a subject lately recognized as extremely necessary in manufacture. One well-known firm of wage incentive engineers selects the new members for its growing staff by demanding a 20-80 ratio in the make-up of the candidates on the employment waiting list. The 20% or smallest factor embraces education and common sense, whereas the 80% requirement, which is called Contact, concerns certain personal qualities the applicant must

possess at the time of hiring. If he lacks one or more traits but has latent characteristics which can be developed, he is hired, provided it is felt he will soon qualify for the 80% specification.

Space will not allow me to name here the many personal qualities the successful time study man must have besides his knowledge of the mechanics of stop watch technique. The study of human relationships in industrial plants is a subject too comprehensive to attempt here. Were I to try it in a few statements, the words, of necessity, would have to be deliberately chosen and I might not accent some of them properly.

In that connection, I am mindful of the married couple having two young children who were beginning to notice and acquire some of their parents' words and phrases. In the past the parents' language had been somewhat salty, so they felt it wise to purify all statements made by them. One night after putting the two children to bed, the mother noticed a moth winging its way to the woolen closet, and in her attempt to give chase, she slipped on a rug, fell to the floor and cried, "damn that M-O-T-H." The spelled word in this case was obviously the wrong one accented.

Group Work Incentive

The protagonist of a group work incentive plan has much to say regarding its excellence and will become quite voluble in defense of that form of system. Contrariwise, the advocate of individual incentive plans will offer cogent reasons why group systems are not desirable. Farsighted management listens attentively to both disciples, and after weighing all facts, will adopt a plan, whether it be group or individual incentive, best suited for its particular needs. Management may recommend the group scheme for part of its manufacturing, and individual incentives for the remainder of the factory.

Regardless of the type of wage incentive plan in use in the factory, the procedure of timing operations need not vary. The procedure should be such as to permit of successfully timing every direct and indirect labor task in the plant. No complex operation should be passed over by saying it is too complicated to reduce to standardization and time study.

When each operation is in readiness for the services of the time study man, he is concerned with four major things which are: quality of work; quantity of work; economy in the use of materials and equipment; and the proper reward to both employees and employers. These four items must be constantly kept in mind.

On an assembly operation, the time study man is interested in the manner in which all work is brought to the bench. It may be delivered by truck, conveyor, chute or other means. Where each piece of unfinished work is placed before starting on it is the first item to engage attention. A piece of work located one foot away is more accessible than one two feet away. An unthinking trucker can cause many extra hours of work per year by his dumping of work in the wrong spot within a work station's area.

The next step in time study is to know exactly what is to be done to each piece of work, the tools to do it with and the best way of performing all movements incidental to the task. In fact, a knowledge of preceding processes and subsequent ones must be had in order to make the proper analysis and to standardize and time all operator work movements.

So many articles have appeared in various technical magazines concerning the exact spotting of work on benches, the position of tools, the two-handed activities required of the operator, not using one hand as a holding device, etc., that I will not restate these well-known principles which are familiar to you. They are merely the routine details observed by any good time study man.

Splitting Up the Work

Splitting up the work movements of a bench job into distinct sub-divisions of work comes next. These sub-divisions are called Elements and are recognized individually in order that each may be analyzed and timed. The scope of each element, i.e., its beginning, duration and end almost suggests itself on each job. The laying down of a tool, the click of the bench vise handle after clamping, the picking up of a gage, the securing of a file, the completion of a hole reaming, the placing of a finished piece of work in a box, all represent phases of operator work movements, which are different elements in each cycle of work. A cycle covers the so-called

floor-to-floor duties and may consist of but few or many elements. Elements should not be too long; their scope should be short enough to permit of accurate analysis and timing. Merely timing an element means nothing—the effectiveness of the timing must be analyzed.

When the elements are properly plotted and arranged in the correct sequence of operator occurrence, each element, as stated, must be recognized individually as a separate story. To that end, the observation sheet of the time study man must finally reflect each element having attached to it the right net time posting and its accompanying rest allowance. Thus, each elemental time posting, plus fatigue allowance, becomes a sub-standard to be used for comparative and cost purposes. We use blueprints to officially portray a part to be made, and a master observation sheet should show the correct work movements necessary to complete an operation of that part together with the prescribed time allowances.

Time Allowance

What is a time allowance? Is it the mere time posting one secures from the stop watch? The answer is, as per the title of a song popular not many months ago, "No, No, A Thousand Times, No!" One should not use the average or mean watch readings, nor should he use the minimum watch reading per element. A watch reading means nothing unless it is evaluated.

Let us take two bench hands; one is noticeably slow in the completion of his work, whereas alongside of him is another workman doing the same job who is quite fast. In timing each of these men, the watch will reflect minimum and average times for both performances. Even if the shortest elemental times of the slow man were compared against the average or longest times of the fast man, the two sets of figures might disagree materially. The mere actual stop watch readings of either man should not be used. The readings can be used, however, if each reading carries with it a symbol which indicates how slow the slow man was and another symbol showing the effectiveness of the fast man. The symbols I refer to are the Bedaux rating factors so universally used and which properly set up a value for each work element no matter at what speed it is done.

Editor's Note: Part II of this article will follow in an early issue.

TOOL ENGINEERING IN ENGLAND

By

R. R. Weddell

Member A.S.T.E.

BUSINESS activity in England continues at a high pace. For several years there has been an increasing demand for a better standard of living there. Production of automobiles, radios, household appliances and even bicycles has had no let-up. Building construction, particularly of new homes, has been very active for the last five years, some 20 per cent of England's population are living in houses that have been constructed within that period. On top of this has come the big so-called Defense Program, more of which will be mentioned later.

All of this has materially affected the machinery industry, machine tool plants having worked night and day for four years. Long deliveries, up to fourteen months, are the rule rather than the exception. Machine tool manufacturing is somewhat different than here. The Britisher is more critical of the machine as a whole than the American. The buyer likes to know all about what makes the machine work, while the American generally is only interested in the results the machine produces. The Englishman thinks his fine machine work should extend all over the machine. You will see shafts and slides that have no mating parts—they fit the air—that are ground all over. The British workman takes an intense pride in his workmanship.

The English Tool Engineer who is connected with machine tool organizations finds their set-up similar to here. Guaranteed recommendations are made with the machine tool. Only, considerable more standard machine tools, as lathes, planers, or milling machines, are recommended with special tooling or fixtures. It is only very recently that special single purpose machines are offered as has been done here for some time.

The comparative low production of products makes necessary this practice. Motor car production in England this year may reach the 400,000 mark, hardly one-tenth of ours. The Ford Motor plant at Dagenham when in production is good for about 1500 cars a week; Austin Motor at Birmingham makes about

2000. However, the latter production is on eleven different models, ranging in size from the Baby Austin, which we laugh at here, and a car as big as the small Buick. All of this calls for special ingenuity and skill in designing and adapting standard machine tool equipment with simple, universal, and economical tools. The Russians buy considerable equipment in England. At Arcos (The Amtorg of England) they say they buy their high production equipment in the U. S. A. and their small productive requirements, which are considerable, in England.

The manufacture of aircraft for the British Defense Program has caused a considerable furore. Tooling on these items is jammed in all the tool shops. Here, due to the necessity for quick action, standard and even foreign tools, as we locals know, have been purchased as the British machine tool manufacturers could not meet the demand. Tooling for these in such plants as Bristol, Rolls Royce, Napier, and others, are made to suit standard equipment, using intricate and highly accurate fixtures and tools to attain the refined work.

British machine tool design does not suffer in comparison with this country when one considers their demands. They do have some interesting features not generally seen here. Motor drive and electric push-button control are quite prevalent. Dual control is seen on large planers and milling machines. They have electric locking where the pushing of a button locks the machine tool saddles, arms or slides. One radial drill manufacturer offers direct speed and feed dial markings on his machines. That is, you set your dials to so many feet per minute for a drill so big in diameter and the spindle rotates at the correct speed. The feed per revolution, too, is set directly.

In the use of cutting materials, England lags, perhaps because of the lower productive requirements, although you will see all the latest developments there. Before the war, English high speed steel was superior to ours. Afterward, the impetus our tool steel mills received from the war improved the American analysis and quality over theirs; now, however, they are equal to us in the standard 18-4-1 and super-cobalt grades. You do not hear

much of the moly or super vanadium steels there as yet. Steel production is at peak there. For a few days while I was there, all prices were withdrawn for several days until a price of one dollar per pound was set.

Stellite tools are probably the least developed. Practically all in use have initially come from American sources. The Deloro Company, the British Stellite manufacturers, are working to improve the situation. For some time, however, their quality did not compare with Haynes.

Carbide tools should enjoy a wide market in England as they are much cheaper there than here. There are several concerns offering it under the trade names of Wimet (which is the same as our old Widia and made in Germany) and Ardoloy made by the British G. E. interests. They also are interested in titanium carbides which are not so popular here; however, lack of high production machine parts restricts its extensive use. Labor in England in the machine industry dominates the situation today, but British labor is sane and reasonable in its demands. The labor program is further advanced there. Jobs are plentiful for the skilled or semi-skilled workman. There is a shortage of skilled men, probably more than here, due to the higher rate of activity and because of the lack of development of skilled men.

There is considerable use of child labor in England. When they are 14, children get their labor cards from the government. Many fib about their ages in order to go to work. Manufacturers requiring unskilled labor use these kids by the thousands for a few years work until they are 21 when they are replaced by other children.

The dumping of these unskilled boys and girls is one of England's serious labor problems, as they are meagerly supported by the dole. All British workers' wages, young and old, are docked in small amount to contribute to partially support the dole. All of this, though, does give those that do obtain skill, a superior advantage.

Tool Engineers are developed from the apprentice system, or from the public schools. Conditions being as they are, there seem to be more

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Nomenclature and Terminology Applied to the Teeth of Milling Cutters

By
O.W. Boston
Member A.S.T.E.

Professor and Director, Department of Metal Processing, University of Michigan, Ann Arbor

THE OCTOBER, 1937, ISSUE of "The Tool Engineer" carried several interesting articles relating to the subject of milling. The lack of standardized terminology relating to the subject of milling cutter teeth is again emphasized. The American Standards Association Standard B5c-1930, sponsored by the National Machine Tool Builders Association and the American Society of Mechanical Engineers, covers in a very adequate manner definitions and dimensions applied to milling cutters. It is inadequate, however, with respect to the terms relating to the teeth of the cutter.

The American Standards Association Sectional Committee B5, of which Mr. W. C. Mueller† is chairman, has some twenty technical committees engaged in the standardization of small tools and machine tool elements. Standards of nomenclature already have been prepared for many items, such as singlepoint tools, drills, taps, etc. As yet these terms have not been extended to milling cutter teeth. The writer, as chairman of Technical Committee 17 on Nomenclature, is charged with the duty of encouraging the development of standard terms and of correlating the terminology applied so that they will be consistent when applied to tools of different types.

Below is given a list of figures of plain, side-cutting, and face milling cutters, together with definitions of the various tooth elements indicated. These terms are at the present time, as far as milling cutters are concerned, entirely unofficial, but it is felt that an expression of opinion from the membership of the American Society of Tool Engineers would be of interest and value. Should sufficient suggestions be received to justify it, the writer will attempt to correlate them and report the results back through the columns of "The Tool Engineer." It

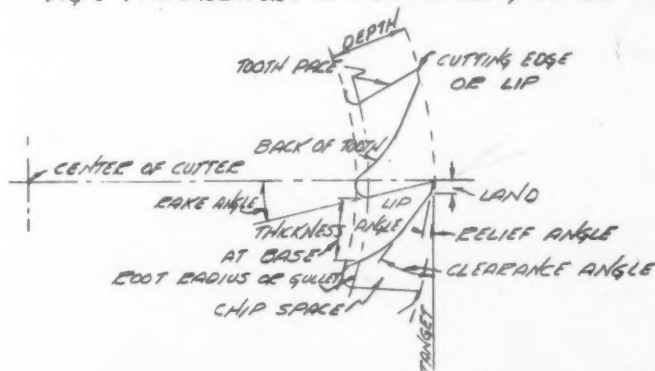
is realized that many of these terms are used commonly in trade literature and in the shop. Some terms given may conflict with general usage. An effort has been made to have each term imply a definite meaning and yet be as simple as possible. It will be observed that clearance is generally understood by most of us is here termed relief and vice versa. This is the result of a motion passed by the Committee on Nomenclature at its last annual meeting.

A suggested nomenclature for the teeth of milling cutters of the plain, side and face milling types is as follows:

Plain Milling Cutters, Fig. 1

1. The **tooth face** is that surface of the tooth on which the chip impinges as it is removed from the work.
2. The **chip space** is that space between the back of one tooth and the face of the next.
3. The **rake angle** is the angle measured in a diametral plane between the face of the tooth (or a tangent to the face at the cutting edge) and a radial line passing through the cutting edge. If the tooth face is radial, the rake angle is zero. If the cutting edge is ahead of the bottom of the face, the rake angle is positive.
4. The **cutting edge** of the profile
5. The **land** is that surface back of the cutting edge ground or relieved to produce the relief angle. (Note: Land has been agreed upon by T. C. 7 on Drills as a term to define the ridge on the leading edge of the rib which is ground cylindrically, that is, it has no relief. Land also is used in the tentative standard for taps.)
6. The **relief angle** (formerly known as clearance) is the angle between the land and the tangent at the cutting edge.
7. The **clearance** is the minimum angle between a tangent at the cutting edge and the back of the tooth below the land. The clearance surface may be produced by a continuous curve from the land to the bottom of the tooth or by one or more straight lines. The back of the tooth in Fig. 1 is formed by the land, which provides the relief, and a primary and secondary clearance surface.
8. The **lip angle** is the angle measured in a plane perpendicular to the cutting edge between the face and land.
9. The **root radius** (or gullet) is the circular fillet joining the face of one tooth with the back of the next to form the chip space.
10. The **depth of tooth** is measured radially from the cutting edge

FIG. 1 NOMENCLATURE OF PLAIN MILLING CUTTER TEETH



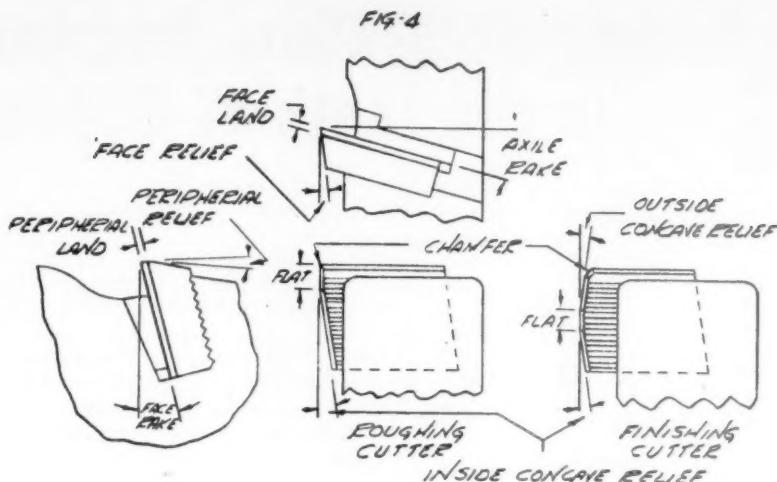
† Assistant Superintendent of Manufacturing Development, Western Electric Company, Chicago.

- to the bottom of the root radius.
11. The **thickness of the tooth** is the length of the chord connecting the face of one tooth with its back as measured along a circle passing through the bottom of the root radius.
 12. A milling cutter is designated by its number of teeth.

Helical Milling Cutters (often erroneously called Spiral Milling Cutters)

- 1a. **Helical mills** are similar to plain mills, except that the cutting edges, instead of being straight elements of the outside cylinder, form helices in the surface.
- 1b. Many so-called helical mills with short inserted blades have blades which are straight and at an angle to the axis, rather than being a true helix.
2. The **helix angle** is measured between the tangent to the helix and a line parallel to the axis of the cutter.

Practice of Some Companies: Helical mills with small helix angles are called **slow helical mills**, while those with large helix angles (above 45 deg.) are called **fast helical mills**. Also, some have a regular series up to 25-deg. helix, heavy duty series 25 to 45 deg., and so-called helical mills having helices above 45 (average 53) deg.



Side Milling Cutters, Fig. 2

1. **Side milling cutters** have cutting edges on the sides, as well as on the outer edge, or periphery, of each tooth.
2. **Side relief** is the angle back of the land on the side of the cutter. It is the angle measured between the land and the diametral plane at right angles to the side cutting edge. The **side relief angle** of side milling cutters corresponds to the **end relief angle** of end mills and the **face relief angle** of face mills.
3. **Concave relief** is the angle be-

tween the side cutting edge of the tooth and the diametral plane. It prevents dragging of the inner ends of the side cutting edge or radial teeth.

Half-Side, End Mills, and Face Milling Cutters, Fig. 3

1. **Axial rake** is the angle between the tooth or blade face and a line parallel to the axis of the cutter as measured at the periphery of the cutter. This corresponds to the helix of an end mill.
2. **Face rake angle** is the angle between the face of the tooth at the periphery and a radial line measured in a plane perpendicular to the axis of the cutter.
3. **Peripheral relief** is the angle between the peripheral land and a line at right angles to the axis and radius. It corresponds to the relief on a plain milling cutter.
4. **Face relief** is the angle between the face land of a cutter tooth and a line at right angles to the axis and radius of the cutter.
5. **Concave relief angle** is the angle between the face cutting edge and the diametral plane. It may be **inside concave relief**, Fig. 3, or **outside**, i.e. away from the cutter center, Fig. 4.
6. **Chamfer** is the surface joining the peripheral and face lands. It may be one or more flat surfaces or a curved surface.
7. A **flat** is the small portion of the face cutting edge ground in the diametral plane, Fig. 4.
8. The **checking ring** is a narrow annular surface ground truly in a diametral plane on the face of the body of the cutter but inside and back of the face of the teeth. It is used as a reference gage surface for truing the cutter.

FIG. 2 NOMENCLATURE OF SIDE MILLING CUTTER TEETH

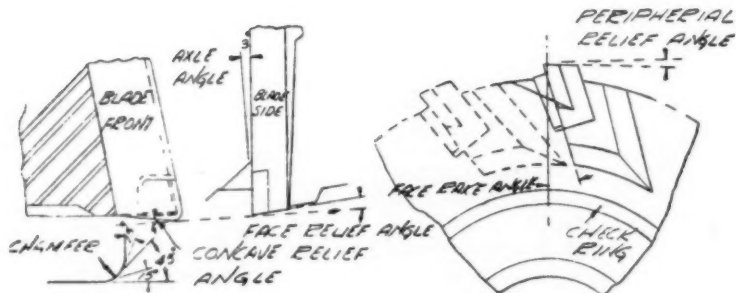
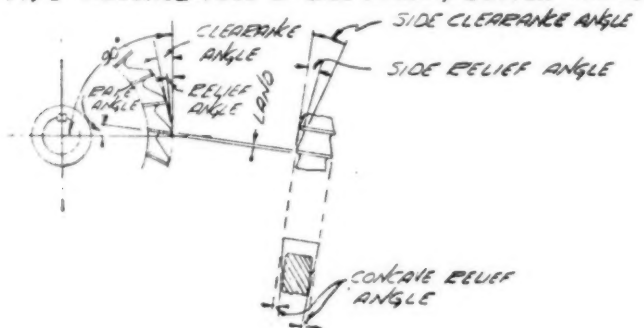


FIG. 3 NOMENCLATURE OF FACE MILLING CUTTER TEETH

Effect of Industrial Design on Machine Tools

By

Lawrence Blazey

Designers for Industry, Inc.

JUST how much money is lost each year through the development of machine tools mechanically without regarding style and design as part of that development is hard to estimate. We do know that machine tools with smooth sleek appearance properly designed for eye appeal have sold faster than similar ones of awkward appearance. When machine tools are purchased, executives look for the same qualities of design excellence that they impart to their own manufactured products. There is no denying the fact that a large percentage of industry is now style conscious and justly so. Would it not be logical that plant executives should choose machine tools that exemplify these new ideals of form and beauty when in the role of buyer instead of maker?

In the past, manufacturers and workmen alike were satisfied with tools that supplied a satisfactory substitute for manual labor. Even as late as in the 1920's, little thought was given to the matter of improving appearance of machine tools for the reason that industry had not yet been surfeited, there were good markets for tools of all kinds; and competition for the consumer dollar was not so keen as at present.

Along with social evolution there likewise has been an industrial evolution involving not only the factors of faster production, multi-competition, price appeal, and refinement of mechanical operations, but also a decided change in factory construction, maintenance and operation with special emphasis upon improved working conditions. New factory styles are revolutionary not only from the standpoint of exterior design in steel, glass and glass brick, but interiors likewise are styled and planned from the standpoint of appearance in conjunction with planning for greater efficiency, more light and greater comfort for employee.

In contrast with the almost haphazard alignment of tools and workmen in poorly lighted, dingy factories we now find factory interiors scientifically equipped with every

modern convenience for the employee and scientifically planned for cleanliness, clear vision and improvement of quality and quantity of production.

This new order of things places considerable emphasis upon the machine tool, its operation and its appearance. It has been definitely proved that operators take especial pride in the equipment that is new and presents an attractive appearance along with operating improvements. Material and mechanical though they be, a self-respecting vanity seems to emanate from well designed attractive tools and the psychological influence is such that the operator finds special pleasure and delight in the new modern tool. It is a "dandy" machine that he likes to put through the paces in precision operation with the result that production is speeded up and rejects are minimized.

And so we find that machine tool design plays an important role in the ultimate of all production, namely, sales. In application of the word sales we obviously must consider sales from two angles. First the sale of the improved machine itself and

second the sale of the products it is instrumental in turning out.

Buyers for industries and factories are just as sensitive to appearance values in the equipment they buy as they are in the purchases of things of a more personal nature. They are inclined to interpret appearance in terms of mechanical perfection. If a machine tool is marred by protuberances and attachments that look as though they were an after-thought, or merely stuck on where least resistance dictated, that tool psychologically bears the stigma of being cumbersome, crudely designed and possibly haphazard in performance—a psychological reaction to be sure, yet one that not only is a handicap in the sale of the machine but likewise a handicap to efficient use.

On the other hand, let us take a machine tool that has well thought out lines, one with well organized controls, handles, parts and housing that combine to give an impression of mechanical perfection in construction and in operation. The immediate mental reaction to such a tool on the part of the buyer as

(Continued on Page 40)

Compact streamlined design features the cast aluminum body of the new Skilscaw disc sander, which is minus protuberances or lapjoints, and of perfect balance and easy to handle.



HELICAL GEARS

By

E. E. Houston

Member A.S.T.E.

Paper presented to Milwaukee Chapter
on November 11, 1937

TOOl Engineers are all more or less familiar with the processes used in generating spiral or helical gears. This evening, however, I will confine my discussion to those problems which the average tool designer must solve in his daily practice.

It is always interesting to delve into the tomes of history to find just where spiral gears and the hobbing process originated.

The invention, or discovery, of the wheel and axle was not made until civilization was relatively far advanced; but it seems probable that the invention of the toothed gear wheel followed soon after the invention of the wheel and axle. A toothed gear wheel, therefore, is probably one of the oldest machine elements and, at the present time, one of the most indispensable ones.

According to written records toothed gear wheels for transmitting power and for transforming motion of power, were used by the ancients. In those times the prime movers or sources of power were human beings or animals. Later the energy of wind and falling water was used for doing work, and in the course of time the machine age commenced.

As a consequence the development of toothed gearing for transmitting large powers became a necessity. Wooden gears were used first, and some of these can be found in disused wind mills; probably some are still in use. In the light of present knowledge such gear wheels look crude.

It is less than two centuries ago that cast iron was first used in mill work. According to Professor Robert Willis, who quotes as his authority, "Farey on the Steam Engine," cast iron was first used in Scotland in 1769, and afterwards it was used for large gear wheels. Prior to that time, however, gear wheels were used, presumably made of metal, for clock work, and it is due to horologists that the correct geometrical formation of gear teeth was understood about a century earlier.

A helical gear cut of solid stone some eight or nine centuries ago, was found recently in an old castle in Sweden. It was no doubt used to drive some ancient community flour mill. We see that the people of the middle ages had a very clear con-

ception of the advantages of a helical gear set up.

If your imagination will carry you back we see that the first hobbing machine was some "Guy" who was exceptionally good with a hammer and chisel. Probably the first manufacturing engineer was the guy who cut the gear.

Gears known as helical gears were invented in 1666 by Dr. Hooke of Cambridge University, England. His description of the invention is given in Professor Willis' book entitled "Principles of Mechanism." Like many useful discoveries, it was not appreciated or used for a considerable period. It seems to have come into practical use early in the Nineteenth Century—approximately one hundred and fifty years after its discovery.

Helical gears in the modern sense were born about 30 years ago, when a Swiss engineer invented the Wuest Gear, which bears his name. It was true that the principle was understood before that time, and a few attempts had been made to cut helical gears but these single helical gears found little favor because of the lack of adequate thrust bearings.

Early pioneer work was done by the Power Plant Co., of England, who acquired the British rights for the Wuest patent. Wuest gears, or spiral gears, were introduced into this country by the Falk Corporation of Milwaukee in the year 1910.

Early gear manufacturers gave much more attention to the strength of the tooth, rather than to the accuracy of the tooth form. The early success of the helical gear was due in most part to the greater care in workmanship necessary to produce the gear. The methods used at that time were far superior to those used for general spur gear practice. The helical gears were far from being accurate. Since that time, however, the hob manufacturer, together with gear producers have closed the gap between theoretical perfection and practical performance.

Let us take a practical example in

helical gear cutting. For the example we shall take a gear with 43 teeth, and a helical angle of 18 degrees, 12 minutes. We find the best machine available in our plant for this job was a Schukardt & Schutte, horizontal type.

The hob used on this job was a seven thread hob, and at this time we find nothing unusual required in this gear except that extreme accuracy was specified.

Now our general formula for finding the lead gears on the Schukardt & Schutte machine, which undoubtedly is the most important part of the set up, is as follows:

$$\frac{\text{Feed in inches} \times \text{Tangent of Helix Angle}}{\text{Pitch Diameter} \times .001309} = \frac{\text{Drivers}}{\text{Driven}}$$

There are three things which must remain constant in the lead gear formula: the feed, the pitch diameter and the constant (.001309). Accuracy in the gear ratio would tend to make an error in the lead. Subsequently we find that changing the lead, we change the helix angle, and changing the helix angle we change the tooth form.

Several weeks ago a representative of one of the large hobbing manufacturers was called in to check a hob. This gentleman thought that an error of .0001 in the gear ratio was close enough but we found on a relatively short lead a change of chordal thickness in the gear of .014.

Going back to our 43 tooth gear, this gear was originally designed with 42 teeth. Using a 7 thread hob we found that every sixth tooth had an inaccuracy in tooth form and chordal thickness. Some authorities in Milwaukee, who are well versed in gear cutting practice, stated that this could not be the fault of the hob since class A hobs are held to 4/10 of 1000. Nevertheless it is advisable to use the hunting tooth system wherever a multiple thread hob is being used. We shall assume that the tool designer whose job it has been to calculate the set up on this machine has carried out his job with extreme accuracy, the rest is up to the man who is operating the hobbing machine.

Most gear noises are caused by faulty workmanship. There are frequently many excuses for poor

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Report of American Society of Tool Engineers Semi-Annual Meeting Detroit, October 22, 1937

Editor's Note: Mr. M. A. Blu, member of Chicago Chapter A.S.T.E. representing his chapter, as a director at the Board of Directors' Meeting held in Detroit, October 22nd, 1937, gave the following noteworthy report of this meeting to his chapter. Its conciseness and completeness, prompt its reprint here, as of interest to all A.S.T.E. members.

CHAIRMAN, AND FELLOW MEMBERS: I see quite a lot of visitors in our midst this evening. In order to explain matters to the men who are here for the first time, may I say this—The Tool Engineering Society is a National Organization with headquarters in Detroit. The governing body consists of thirty-three men who are elected to attend these meetings in Detroit twice a year to plan the business for the year. I have been elected and I want to thank you for voting for me. I have attended many conventions, but this is the first convention that did not have a lot of entertainment going on, it was strictly business. The men were from all over the United States and were very business-like. There were many recommendations pertaining to the governing body of the Society but the matter of dues was left alone.

The men represented some very large concerns such as the following: Packard Motors, Spicer Mfg., Dodge, National Twist Drill, National Automatic, Lincoln, Sundstrand, Nash Motors, so you can see for yourselves just what type people belong to this organization.

The program as outlined covered just one day, beginning about 11 o'clock that morning and lasting until midnight.

The minutes of the last meeting were read, as was the treasurer's report, committees' reports, discussions about the chapters, balloting on new members (applications being governed by this body), delin-

quent dues were discussed and an operating budget was set up.

The budgeting department consists of men who are used to handling large sums of money. They scrutinized the accounts for last year and set up an economical budget which still gave many benefits to the members. One of the important features about the budget is the fact that we have only one man receiving a salary. Everything else is spent for traveling, telephones, office, postage. All in all, the budget for the National is very low. Expenses of delegates to these meetings is offset by the local chapters.

For the benefit of those who do not know the extensiveness of this Society, we have chapters in most of the large centers. Here are a few examples of the places where meetings are being held now: Baltimore, Detroit, Rockford, Bridgeport, Hartford, Milwaukee, and there are many others.

Five new chapters have asked for permission to join up. We have a total membership of about 1500, but expect it to reach 2200 in the next year or so.

The reason for our expecting more members is because the small industrial organizations are clamoring for technical information that is now only available in the large industrial centers. This information is offered to them through "The Tool Engineer" magazine.

To get back to the budget, it cost the General Headquarters \$4.80 a

member to operate. For the year 1938, they have set a budget of \$9000.00.

Since we expect a larger membership, we think we can safely control the expenses. We expect to run in the black this coming year.

Some local chapters wanted to know why they could not run their own chapter the way they thought best. Well, each chapter does, more or less, run things in its own way insofar as it is beneficial to the men.

The National Committee reported that only five chapters are in the black and the rest of them are in the red.

The National Headquarters say much for expenses and tell us that we have been sending out more literature than we have members. We are now about \$40.00 in the red with the National Headquarters.

Another question that arose, was that of back dues. We are about \$35.00 in arrears for back dues for the year 1937. We think that every man who has not paid, after investigation, can and will pay up his delinquent dues.

The National Headquarters seem to expect more of the Chicago Chapter than they do of any other chapter. I am sorry to say that our chapter is not growing very rapidly in comparison to some of the others. Rockford has us beaten. They seem to have a very good system to get more members though—they have a membership committee with a representative in each shop, who personally takes interest in seeing that all the men come out to the meetings. Of course, this cannot very well be done in Chicago, due to the fact that because of its extensiveness, too much ground would have to be covered. We will just have to rely on our own members to contact more men to come down and find out what the Society is doing and have them join up.

PRODUCTION PERSPECTIVES

News of Mass Manufacturing from Everywhere

Mid-West

From Cleveland, Ohio, comes the news that the **Eaton Manufacturing Company** reports no letup in its business and is understood to have obtained additional contracts for 1938 model automobile and truck parts, as well as a renewal of all contracts it had for 1937 cars. Most of the business is in the valve and axle divisions and the company has a new outlet for its hydraulic valve lifters which previously had been used only on high priced cars.

From Chicago we hear that **Mr. C. G. Frantz**, President of Apex Electrical Manufacturing Company, Cleveland, has reported the best third quarter in the history of the Vacuum Cleaner Manufacturers Association. Vacuum Cleaners shipped by members of the Association in July to September period totaled 354,944 compared to 334,391 for the same quarter of 1936.

The **Auburn Automobile Company**, Auburn, Indiana, is going in to manufacture of air conditioning equipment. The company has bought up patent rights on 18 pieces of equipment.

National Screw Machine Products Association's national headquarters have been moved from Detroit to Suite 201 at 12319 Shaker Square, Shaker Heights, Cleveland suburb, according to announcement of **Orin Benson Werntz**, legal counsel and secretary of the association.

The **Regal Engine Company** of Coldwater, Michigan, recently purchased the assets of the **Esco Engineering Service Company** of Toledo, Ohio, whose principal business is the manufacture of special types of jigs and tools such as are used extensively in mass production and metal working plants generally. **Regal Engine Company** has also purchased the **Machine Shop and Equipment** of **Edward Roberts** who has been operating his company in connection with the **Homer Furnace and Foundry Company** and does general machine work—mostly machining of automobile parts, the castings for which are made by **Homer**. Both of these plants will be moved to the present **Regal Engine Company's** facilities at Coldwater.

A.S.T.Eer W. J. (Bill) Fors, after



Phil Huber, who has been made President of Ex-Cell-O Corporation, Detroit. He succeeds N. A. Woodworth, who resigned because of ill health. Mr. Huber was one of the original organizers of the company in 1919.

seventeen years of married bliss, is now the proud sire of **W. J. Fors, Jr.**, seven and one-half pounds—October 25th.

We are very sorry to hear that **Ernie Squire** and **C. A. Birkebak**, both of **Ex-Cell-O**, Detroit, were in a serious automobile accident near Pontiac, Michigan on November 18th. Both men were severely injured and were taken to the St. Joseph hospital, Pontiac. They had given a talk before the **General Motors Institute** in Flint and were returning to their homes when another automobile went out of control smashing into their car at a high rate of speed. **Detroit and Michigan A.S.T.Eers** join in wishing these friends speedy recovery.

An addition to the T-P line of set-up tools is announced by **The Taft-Peirce Manufacturing Company**, Woonsocket, Rhode Island. New magnetic parallels are now in stock in two sizes: $\frac{3}{4}$ " x $1\frac{1}{2}$ " x 3", and 1" x 2" x 4". These parallels are made with alternate laminations of brass and steel, but are magnetically universal in that they may be used on all models of **Taft-Peirce Superpower Magnetic Chucks**, and

in fact on any type of magnetic chuck face plate. It is understood that another addition to the **Taft-Peirce** line will shortly be announced, in the form of two sizes of **Magnetic V-Blocks**.

New England

Production and employment showed some decline in November in Western New England territory. While no pronounced rise is anticipated for this quarter, it seems probable, on the other hand, that operations will not fall greatly below the present level. With automotive production on the rise and with refrigeration and air-conditioning manufacturing due for an increase early in the new year, constructive elements are in sight to offset weakening lines in the metal group, and in radio and oil-burner production and textile industry in the near future.

Machine tool production is maintaining good volume, mainly on the strength of orders placed last summer, and some very good new orders are being placed for some lines of durable goods. Aircraft establishments are very active, with unfilled orders reported sufficient to insure top production throughout the first quarter of 1938. The usual seasonal declines in radio and oil-burner production are forecast.

Reductions have been made by **Chapman Valve Manufacturing Company** in some departments, but such losses are said to have been practically offset by gains in others. **Van Norman Machine Tool Company** has released a few workers. Producers of small tools are busy, though buying less material because of good stocks on hand with the approach of inventory-taking.

A seasonal layoff at the **Westfield Manufacturing Company**, Westfield, included about 60 men employed in the machine shop, frame room and other departments. The slackening of production is due to the yearly late fall slump and is expected to be of short duration.

In the tap-and-die field, business is moderately reduced, **Greenfield Tap & Die Corporation** has laid off a considerable number of employees this month. Railroad buying is largely in abeyance, and for that reason layoffs are reported from plants

(Continued on Page 38)

CHAPTER DOINGS

FIRST MEETING OF BALTIMORE CHAPTER

J. I. Buckley, Publicity Chairman
5303 Elserode Avenue, Baltimore

Great interest was evidenced by the splendid turnout of 75 members and their friends for the first meeting of Baltimore Chapter 13, which was held at the Longfellow Hotel.

Mr. R. E. W. Harrison, Vice-President of the Chambersburg Engineering Company gave a most enlightening talk on "Modern Drop Forging Practices." Although in his audience were men from widely diversified industries; such as Automotives, Railroad, Instrument, Electrical, Drilling Equipment and Airplanes; his subject was of great value to all. In his discussion he pointed out the ever increasing importance of light weight and high strength factor gained by the application of steel and alloy forgings, and related a short history of the development of drop hammers from the old board type hammer up to the latest air and steam hammers.

Visitors from out of town were: Conrad O. Hersam from Philadelphia, and Mr. Cetrule from Newark representing the Society's Chapter No. 14.

The meeting was preceded by a dinner which was served at 6:30 P.M. Committee appointments were announced as follows:

Meetings Committee: Mr. G. C. Voigt, Chairman; Mr. C. W. Sappe, Mr. W. Adler.

Entertainment Committee: Mr. M. Kost, Chairman; Mr. H. M. Shealey. Publicity Committee: Mr. J. I. Buckley, Chairman; Mr. J. A. Griffith.

With only one dissenting vote we decided to hold our next meeting, December 13th, 1937 at the same place—the Longfellow Hotel with special meeting for members at 6:30 P.M., dinner at 7:00 P.M., Technical session 8:00 P.M.

Mr. J. A. Snyder, who is associated with the Morse-Twist Drill Company will give an illustrated talk on "The Manufacture of Twist Drills."

We extend every success to Mr. Hersam and his group in Philadelphia now in process of organizing an A.S.T.E. Chapter there. We are planning on being represented at your opening meeting.

BRIDGEPORT

E. H. Ebelhare, Chapter Publicity Chairman
323 Trumbull Avenue, Nichols, Conn.

Bridgeport Chapter's November meeting was held at the Barnum Hotel on Thursday, November 11, preceded by an informal dinner, in the Coffee Shop.

Mr. John Bullard, Chairman, of the Chapter was in charge and C. A. Dundore, Secretary, read the minutes of the previous meeting and also the Treasurer's report.

We want to congratulate Mr. R. Cunningham, Process Engineer of the Underwood Elliott Fisher Co. as the one new member of the month. I want to state here that the members of the various plants in the vicinity of Bridgeport should step on the membership drive for the year of 1938. The Bullard and Underwood plants seem to have the lead with the total, but we would be more than glad to give first place over to some other concern.

I understand that Mr. Page was at the first meeting of the Newark Chapter, but due to the fact that he was unable to attend our meeting this month, I hope that he will give us an interesting report at our next meeting.

Mr. L. Raymond of the Singer

Mfg. Co. of Bridgeport, was the guest speaker, and gave us an interesting talk on the Heat Treating of Tools. He showed some slides and pointed out some of the "Bugs" confronted by the heat treater to harden some of the more intricate designs, that are made by the tool makers.

He gave us a blackboard talk on the strength of certain designs and their per cent of strength in relation to key ways with radius and their sections supported by large and small fillets. I am sure after listening to this talk that designers will not expect the Heat Treaters to do the impossible and put the fault of failure a 100 per cent on them.

Mr. C. Speakman took charge of the discussion period and the members are to be congratulated on the hearty cooperation and interest they showed. This was one of the best periods we had, and we urge that the good work be continued.

We want to congratulate Gustave Samuelson on his successful political campaign on being elected to the Board of Education, in Bridgeport—you see our members are taking quite an interest in the community, besides being engineers.

CLEVELAND

R. B. Oswell, Chapter Publicity Chairman
1585 Hawthorne Drive, Euclid, Ohio

The November 9th meeting of the Cleveland Chapter of A.S.T.E. was an inspection trip thru the plant of the Cleveland Graphite Bronze



Northern New Jersey-New York Chapter 14, organized November 1st, elected officers shown above, left to right: Remo Rego, Treasurer; H. D. Hall, Vice-Chairman; G. Frank Sheely, Chairman; E. C. Broasheer, Secretary.

Company. We were 125 strong and were escorted thru the plant in groups of eight, visiting all the departments from the Receiving Room to the Shipping Room, and including the Engineering Offices and Tool Room.

Most of us, not having any conception of how bearings were made, were greatly surprised to find the number of operations necessary to make a finished bearing—and were much impressed with the speed and accuracy with which this work is carried on.

Another thing of which we took particular notice was the cleanliness of the entire plant: all machinery painted, floors clean, no excess scrap or debris laying around the machines, and the spacious and comfortable lounge and wash rooms for employees.

After the inspection trip we all gathered in the cafeteria and Mr. Kerruish, Chief Inspector, gave a short talk on the development of bearings and answered many questions as to manufacture and inspection.

Mr. Kerruish was followed by Mr. Hanson, Safety Director, who gave a talk on Safety and some of the methods and equipment used in their plant to promote safer working conditions.

The meeting was adjourned at 10:15 and, from some of the comments overheard from departing members, was a very interesting and enjoyable one.

DETROIT

R. M. Smith, Chapter Publicity Chairman
12775 Greenlawn Avenue, Detroit, Mich.

Detroit Chapter and the Toledo Chapter met jointly in the Arabian

Ballroom of the Tuller Hotel, Friday, November 12, 1937. The meeting began at 7 o'clock with the singing of the A.S.T.E. theme song. Dinner was served, the Toledo Chapter supplying the entertainment.

Mr. Staples, Chairman of the Detroit Chapter, called for order at 8:18 P.M., and thanked the Toledo Chapter for the entertainment and for their fine representation. Mr. David Forsman, Chairman of Meetings; Mr. Frank Shuler, National President; Luke Beach, First Vice-President; Ray Brunner, National Secretary; Ford Lamb, Executive Secretary, were respectively introduced and asked to stand.

Mr. Forsman introduced several prominent Detroiters of industry who were present. When members were asked how they liked the surroundings and if they would like future meetings held in the same place, the question was "ayed" by applause.

Mr. Staples took the chair, and introduced officers of the Toledo Chapter: Mr. Earhart, President; Mr. Rennell, Secretary; and Mr. Franklin, Treasurer.

Notice of a dance at the Detroit Yacht Club on Friday, December 10, 1937, was made and members were invited.

Mr. A. L. Brown, Economist of the Investor's Syndicate, gave an illustrated talk on "The Dark Spot in Industry." He pointed out that we have made progress in transportation, communication, industry, disease prevention, and even death compensation, but we have not conquered the dark or blind spot—depressions. The fundamental cause of economic depressions is financial ignorance, or how to manage sci-

tifically the money after it is earned. He elaborated on the great cost of depressions, giving comparative illustrations and figures. What to do about it?—The recipe is to Work—Save—and Have. Discussing the last two points more thoroughly, he explained the methods of investing well so as to have security even in depression.

Mr. S. K. Kuhn, Chairman of the Detroit Industrial Relations Committee, asked members of the different companies represented to assist in placing good prospects. He expressed his appreciation and asked that any member able to render assistance should communicate with him.

Chairman Staples spoke of the operating costs in Detroit and the amount of delinquent dues. Because of this condition it is necessary to ask members to present paid-up membership card or pay admission at future meetings.

Mr. C. W. Spicer, Vice-President of the Spicer Manufacturing Company of Toledo, Ohio, was introduced and he showed several colored scenic landscapes of places he had visited during his recent trip through the southwestern part of the United States. He then addressed the meeting on the subject: "Standardization of Small Tools."

HARTFORD

Frederic L. Woodcock, Secretary
56 Inlay Street, Hartford, Conn.

On Monday evening November 29 the third meeting of the season was held at Hartford Gas Co.'s Auditorium at 8:00 P.M. with an unusually large gathering of mechanical and tool men present.

"Metallic-arc, gas and induction welding" was the subject of a splendid talk by P. J. Horgan of the General Electric Co. A number of visitors from local plants as well as regular members showed marked interest in Mr. Horgan's subject and a lively discussion period followed the talk. It was well illustrated by stereopticon pictures.

There had been many requests for an evening on welding and as a result large groups of men from various plants attended in a body. We have been very fortunate in the caliber of speakers obtained by our Program Committee and due to its efforts our attendance has continued to increase steadily.

Any members interested in some particular subject are invited to send in suggestions. While the pro-

(Continued on Page 26)

C. W. Spicer of Toledo, Ohio, was the speaker, shown below, who addressed Detroit Chapter, November 12th meeting.





ENGINEERED PRODUCTION

EXAMPLES FROM THE SUNDSTRAND FILES

No. 3728

Lathes
Milling Machines
Tool Grinders
Centering Machines
Balancing Tools

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Sundstrand Engineered Production works well for tool engineers, production engineers, master mechanics . . . for all executives concerned with cutting costs, increasing production, and maintaining quality standards on turning and milling operations. Should the machines for your work be special, semi-standard, or standard? Do you want them complete with fixtures and tooling, or do you prefer to supply the equipment? Do you want mechanical, pneumatic or hydraulic feed? Sundstrand Engineered Production

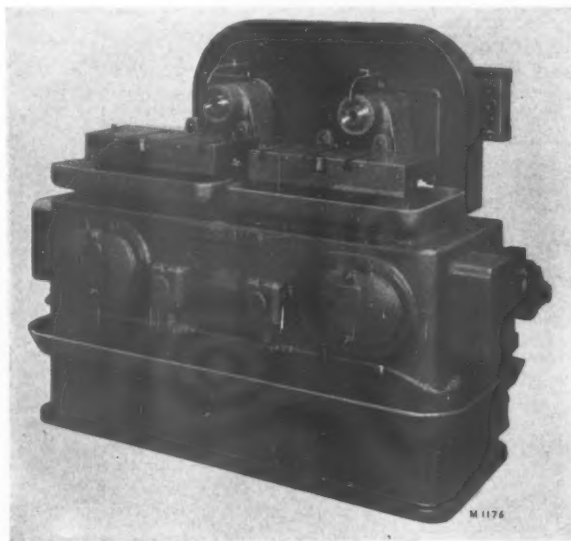


Fig. 1 — Special Rigidmil for milling grooves in spring steel yokes.

meets any practical requirement, and recommends the most economical combinations for best results.

The Rigidmil shown in Fig. 1 is a typical example. Machine is special throughout, designed to use fixtures supplied by its purchaser. Its job is to mill 3 grooves in two inner surfaces of spring steel yokes shown in Fig. 2. Machine has two independent tables each carrying a manually operated fixture as shown in Fig. 3. Machining cycle is started by gentle

pressure of operator's knee against large pad on front of machine, and stops automatically when milling is completed. Production is continuous and limited only by operator's ability to handle work-pieces at one station while milling proceeds at the other. Ample facilities are provided for coolant supply, chip disposal, and compensation for cutter wear. Means are included for changing the operating cycle and spindle speeds so that either can be altered for this job or for performing similar operations on other work-pieces.

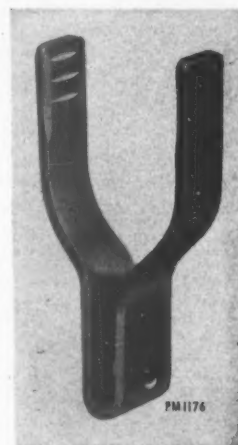


Fig. 2 — Spring steel yoke and three of the six grooves milled.

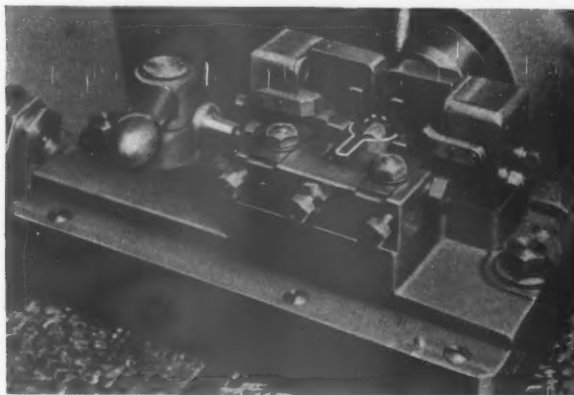


Fig. 3 — Fixture for holding spring steel yokes during Rigidmil operation.

Investigate Sundstrand Engineered Production. Send drawings and data for reliable estimates on your milling and turning.

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2532 Eleventh Street, ROCKFORD, ILLINOIS, U. S. A.

RIGIDMILS - STUB LATHES

Tool Grinders - Drilling and Centering Machines
Hydraulic Operating Equipment - Special Machinery



DECEMBER CHAPTER MEETINGS

BRIDGEPORT

December 9, 1937—Hotel Barnum, East Room, 8:00 P.M.

Meeting: Subject, "Tool Cost—Its origination, distribution, method of handling, recording and information that is available to properly handle costs between the accounting department and tool departments."

Speakers: Mr. Ed Gillane, Underwood-Elliott-Fisher Co. Also: C. A. Shephard on Alco Tools, which consist of Die and Drill Heads, Tap and Die Holders.

BALTIMORE

December 13, 1937—Longfellow Hotel, 2 West Madison St. Dinner 7:00 P.M. Technical Session 8:00 P.M. Special Meeting for members 6:30.

Speaker: J. A. Snyder of The Morse Twist Drill & Machine Company.

Subject: "Twist Drills, their development and use in industry."

Please make reservations early by calling Vernon 5353.

CHICAGO

December 13, 1937—Dinner 6:45 P.M. \$1.25 per plate. Technical Session at 8:00 P.M. Machinery Club, 571 W. Washington Blvd.

Speaker: Mr. S. B. Helstrom, Manager, Detroit Tap & Tool Co., Detroit, Michigan.

Subject: "Tap Grinding, and Special Machinery for Tap Grinding." This subject should be of especial interest to all our members, and we hope to have a good crowd out for this meeting.

Mail reservations to Chapter Secretary, Mr. Willard T. Wilson, 7428 Euclid Avenue, Chicago, Illinois. Please reserve early.

CLEVELAND

December 17, 1937—Guild Hall, Builders Exchange Building, Prospect Avenue, opposite the Higbee Store. Dinner 6:30 P.M. Annual Christmas Party for members and wives or sweethearts, under direction of Entertainment Committee—Henry P. Boggis, Chairman. Further details to Cleveland Chapter members by post cards.

DETROIT

December 9, 1937—Chrysler Corporation Engineering Laboratories, 12800 Oakland Avenue, Highland Park, Michigan. Dinner at 6:30 P.M. in Plant Dining Room, price \$1.00 per plate. Technical Session follows dinner.

Speaker: Professor John J. Caton, Dean, Chrysler Institute of Technology.

Subject: "Is a College Education Necessary?"

A trip through the research division is also scheduled. Members make reservations early with Chapter Officers, Ticket Salesmen, or the National Office, Madison 7960.

HARTFORD

December 27, 1937—City Club. Dinner 6:30 P.M. Technical Session at Gas Company Auditorium at 8:00 P.M.

Speaker: David A. Munns.

Subject: "Manufacture and Use of Plastic Materials."

Motion Picture: The Fourth Kingdom.

MILWAUKEE

December 9, 1937—Dinner 6:00 P.M., followed by a tour through Seaman Body Corporation Plant. Get in touch with officers before December 9, for information where dinner will be held. (This tour for members only.)

NEW YORK—NEW JERSEY

December 14, 1937—Hotel Robert Treat, Park Place, Newark, N.J. Dinner, 6:30 P.M. \$1.25 per plate. Technical Session, 8:00 P.M.

Speaker: Mr. Fred W. Shumard, President, National School of Time Study.

Subject: "Modern Time Study."

Those who may be unable to attend the dinner are urged to come for the technical session. Mail dinner reservations to B. C. Brosheer, American Machinist, 330 West 42nd Street, New York, N.Y., before December 8, 1937.

PITTSBURGH

December 10, 1937—"Hofbrau" Second floor, 25 Graeme Street, Pittsburgh—near "McCanns." Dinner, 6:30 P.M. Technical Session, 8:00 P.M.

Speaker: A. H. d'Arcambal, Pratt & Whitney Company, Hartford, Conn.

Subject: "Recent Developments in Cutting Tools and Gages"—illustrated with lantern slides and specimens.

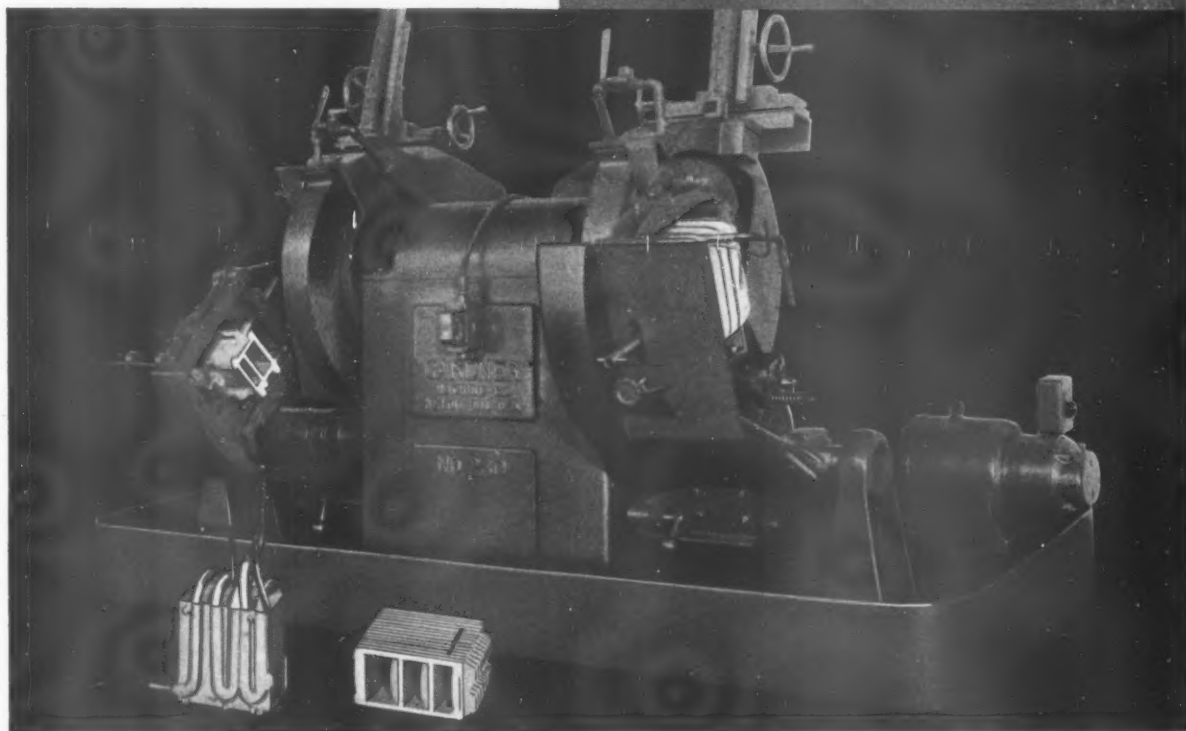
Reservations: Please make dinner reservations before noon Friday, December 10. Call Miss Davenport, Valley 511 or Brandywine 1490.

Evaporator coil assemblies — a tough job "licked" by GARDNER-GRINDING!

The bottom surface of these cast aluminum evaporator coil assemblies is ground flat within $\frac{1}{16}$ " at an average rate of 60 per hr., per operator, on this No. 230-30" Gardner Grinder. Stock removal runs from $\frac{1}{16}$ " to $\frac{3}{8}$ ". The two mechanically oscillated work tables reduce manual effort to a minimum. The job is ground wet.

THESE refrigerator evaporator coil assemblies represent a tough grinding job because of their size, and because they are aluminum castings with a fairly thin wall section. The largest measures $12\frac{1}{2}$ " wide x $10\frac{3}{8}$ " high x $11\frac{1}{8}$ " long, and the bottom surface is ground flat within $\frac{1}{16}$ ".

The machine that "licked" this job is a Gardner No. 230-30" Grinder carrying two power-operated work tables, and our standard wet grinding system. A special hand-clamping fixture is mounted on each table, and two operators are used. Brief production data is printed above the illustration.



Let GARDNER figure on Your tough jobs — Ask for Bulletin 200B!

GARDNER MACHINE COMPANY

442 East Gardner Street , , , , , Beloit, Wisconsin, U. S. A.

Flexibility Is Feature of New Colonial "Universal" Broach Sharpener

A NEW broach sharpening machine designed to handle both flat and round broaches is announced by Colonial Broach Co., Detroit. The machine can be

"Universal" Broach Sharpener for both flat and round broaches just announced by Colonial Broach Company, Detroit.

The broach sharpener table has a maximum travel of 60 inches with an over-all of 72 inches. Adjustment of the table is through a worm and wheel, the worm being oper-



changed over from flat to round broach sharpening and vice versa with but a few minor adjustments and is equally well adapted to both classes of work.

Designated as the "Universal" Broach Sharpener the new machine is of exceptionally rugged construction throughout with heavily ribbed bed and table. It is designed for maximum simplicity in operation.

In addition to the extreme flexibility incorporated in the new broach sharpener additional features provide both a low initial cost and a material saving in grinding time compared with ordinary equipment, long life of machine and its components, and extreme simplicity of service.

The sharpener is provided with a grinding head adjustable through an arc of 180 degrees horizontally, permitting complete reversal of the head. Vertically the head is adjustable from a horizontal position to 90 degrees below horizontal. The head is fitted with a hardened and ground slide traveling on two hardened and ground roller chains riding on hardened and ground ways in the head support. The rolls are held to .0002 inches for diameter and the entire slide mechanism is sealed against the entry of grinding dust. The head is also adjustable for side play. The head is so designed that hydraulic feed for automatic operation may be incorporated if desired. Grinding wheels are five inches in diameter with $\frac{1}{2}$ " face, for sharpen-

ing. For backing off a three inch diameter wheel is furnished. Dust guards over the grinding wheel are provided as standard equipment.

The grinding wheel spindle is direct motor driven with a standard speed of 3600 r.p.m., the motor being of $\frac{3}{4}$ h.p. The spindle is carried in adjustable pre-loaded, double-row bearings and is totally enclosed. Frequency changers permit operation of the grinding wheel spindle at speeds up to 10,800 r.p.m. Maximum travel of the slide is 10 inches. Adjustable stops are supplied on the head and these are fitted with thumb screws permitting a vernier adjustment of the travel. The permanent stops on the grinding head support are spring loaded to cushion the head and wheel against shock at the end of the travel.

Adjustment of the grinding head column vertically is by means of a hand wheel one complete revolution of which equals .025 inches of column lift. The maximum range of adjustment is 10 inches. Hardened and ground ways are provided for the column also.

ated through a graduating hand wheel. For work requiring extraordinary accuracy a vernier worm and wheel mechanism can be supplied to operate the main hand wheel, permitting adjustments to .0002 inches. The table is carried on one Vee and one flat guide, the guides being lubricated by rollers running in oil wells. Table ends are provided with dust guards.

For grinding round and spline broaches, etc., there are provided a head stock, a tail stock and steady rests. The head stock is of the two speed motor driven type fitted with a $\frac{1}{2}$ h.p. 1,200 r.p.m. motor. The head stock has a center swing for 10 inch diameter maximum. The tail stock is of the quick adjustable type and is provided with an adjustment permitting setting broach ends up to $1\frac{1}{2}$ inches off center for tapering of broaches.

Steady rests are of the barrel type taking $\frac{1}{2}$ inch round fibres. They are cam locking and so designed that a single adjustment actuates both sides of the jaws in setting up.

Magnetic chucks are supplied on special order, to operate on a 110 volt circuit. The machine will take flat broaches up to 10 inches in width if the broaches have straight teeth. For angled teeth the maximum width is slightly less. The machine is operated through a push button and has both overload and low voltage releases. Floor space required is only 16 x 4 feet.

MULT-AU-MATIC STANDARD TYPE TOOLING
EASE AND SPEED OF SET-UP ON MULTIPLE
OPERATIONS

Provide

PROFITS ON MEDIUM QUANTITY
PRODUCTION WITH BULLARD
MULT-AU-MATICS



Where quantities of work run from 50 pieces up, the Bullard Mult-Au-Matic has proved to be a profitable operating unit. Ease and Speed of change-over from job to job are possible through use of standard tool equipment. The result is an adaptable, multi-station machine that is a time saver on most lathe jobs.

If other plants both large and small can make money this way — SO CAN YOU. *Let us estimate your jobs — you be the Judge of our statements.*

THE BULLARD COMPANY

BRIDGEPORT

CONNECTICUT

Chapter Doings

(Continued from Page 20)

gram is full for the balance of the season ideas will be of assistance in shaping the policy for next year.

METROPOLITAN CHAPTER NO. 14 ORGANIZED NOVEMBER 1ST

The Organization Meeting of Northern New Jersey, Metropolitan Chapter No. 14, was held November 1, at the Essex House, 1000 Broad Street, Newark, New Jersey, and was preceded by a dinner attended

by about 100 men. There were 116 was called to order by Mr. Frank J. Oliver, formerly a member of Detroit Chapter who had acted as Secretary of the Organizing Committee. Mr. Oliver explained the purpose of the meeting, explained the work of the committee in getting in touch with Tool Engineers of this section, and introduced Herbert D. Hall, Sales Engineer for Vandyck Churchill Company, New York, N. Y., John Dokulil, in charge of tools from point of Standard methods, for International Projector Company, New

Tool Engineers present at the meeting after the dinner. The meeting York City, and Ben C. Brosheer, Assistant Editor of American Machinist, who were other members of the Organizing Committee. He also introduced Benjamin Page, Chairman of the Nominating Committee, of the Bridgeport Chapter, Nils H. Lou, Chairman of the Baltimore Chapter, and Conrad O. Hersam who is working to organize a chapter in Philadelphia. Mr. Oliver also introduced Frank R. Crone, National Treasurer of the society, and Ford R. Lamb, Executive Secretary. Mr. Oliver then turned the meeting over to Mr. Lamb.

Mr. Lamb addressed the group giving a complete description of the development of Tool Engineering and the condition surrounding the science of Tool Engineering which led to the organization of the American Society of Tool Engineers in 1932. He described the early efforts and accomplishments of the Society, and its activities. This address also included description of the control, operation, finance, and costs of the society in complete detail. All questions from the floor relative to the Society were answered. Short talks were given by Benjamin Page, Nils H. Lou, and Conrad O. Hersam describing some of the activities of their chapters and work.

At this time the actual organization of the chapter took place, and the election resulted in the election of chapter officers as follows: Chairman: C. Frank Sheeley, Supervisor of Tool Design, Hyatt Bearings Division of General Motors, Harrison, New Jersey; Vice-Chairman: Herbert D. Hall, Sales Engineer, Vandyck Churchill Co., New York, N. Y.; Secretary: Ben C. Brosheer, Assistant Editor of American Machinist, New York City; Treasurer: R. Rege, Manager, Production Engineering Department, Wright Aeronautical Corporation, Paterson, New Jersey.

Frank R. Crone, National Treasurer administered the oath of office to the newly elected officers, and Mr. Lamb presented Chairman Sheeley with the charter, authorizing them to conduct a chapter of the American Society of Tool Engineers in this section. Mr. Lamb also presented the various officers with all of the equipment, books and records necessary for the administration of the affairs of the chapter, and turned the meeting over to the

(Continued on Page 28)



68 Sizes and Types of Lathes for every purpose.

9" lathe prices start at \$287
11" lathe prices start at \$371
13" lathe prices start at \$448
15" lathe prices start at \$544
16" lathe prices start at \$642

Write FOR BULLETIN

Bulletin No. 13-C illustrates, describes and prices the different models of the 13-inch lathe. Copy sent free, upon request.



SPEED, precision, versatility, and smooth, quiet operation are qualities of the new 13-inch South Bend Series "T" Lathes that have made them the choice of engineers and mechanics everywhere. Hundreds of manufacturing plants, machine shops, and tool rooms depend upon the rigid construction and fine workmanship of these lathes for the most precise tool and gauge work, and speedy, accurate production jobs.

SOUTH BEND LATHE WORKS
927 East Madison St., South Bend, Ind., U.S.A.

SOUTH BEND Precision LATHES
MODERN LATHES FOR MODERN INDUSTRY



In Silver Craftsmanship or Tool Craftsmanship YEARS OF EXPERIENCE MEAN

**THERE IS A
DIFFERENCE**

There is no substitute for years of experience in the craftsmanship that shapes fine sterling designs. Nor in the craftsmanship that guards every process in the manufacture of Morse Tools.

Next time a drilling, reaming, threading or milling job calls for a tool whose manufacture is tempered with experience, prove to yourself that "There Is A Difference."

*A Conveniently Located Morse Distributor
Will Give You Prompt Service*

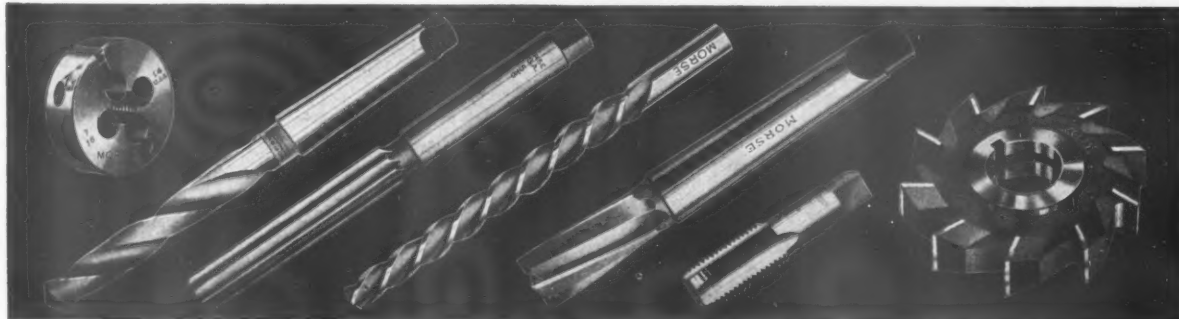
MORSE

TWIST DRILL AND MACHINE CO., NEW BEDFORD, MASS., U. S. A.

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THE MORSE LINE INCLUDES HIGH SPEED AND CARBON DRILLS - REAMERS - CUTTERS - TAPS and DIES - SCREW PLATES - ARBORS - CHUCKS - COUNTERBORES - MANDRELS - TAPER PINS - SOCKETS - SLEEVES



Chapter Doings

(Continued from Page 26)

newly elected officers. It was decided by the Tool Engineers present, that the next meeting would be held Tuesday, December 14th at a time and place to be announced later. Forty-one applications were received, thirty-eight Seniors and three Juniors, and many other applications were not completely filled out, but will be turned in at a later date. This group of Tool Engineers is very enthusiastic, and indications are that this chapter will become one of the most important chapters of this Society.

MILWAUKEE

Emmor E. Houston, Chapter Publicity
Chairman

1029 South 35th Street, Milwaukee,
Wisconsin

Meetings, like the seasons come and go, but we look forward to the December Chapter conclave with the same anticipation and anxiousness that comes with the first Christmas tree. Mr. Smart, Chairman Milwaukee Chapter, announced that for the Chapter's Christmas present we will have the opportunity to see the Seaman Body Corporation plant in operation. The Seaman corporation is the only large automobile body manufacturers in the Milwaukee area.

The officers feel that the tour will be exceptionally educational, since the innovation of all steel bodies has almost revolutionized tool and die practices. The visit to the Seaman plant will follow the regular monthly six o'clock dinner.

Mr. George Fobian, executive of the Oil Gear Corporation was guest speaker at the November meeting and he spoke on "Hydraulic Feeds and Surface Broaching." Mr. Fobian was very well informed on his subject, and many of our Tool Engineers have certainly taken some valuable tips in broaching from him. Due to modesty on the part of your correspondent, who was also a speaker at the November meeting, he is unable to comment on the paper he presented.

Messrs. Senkviel and Wolf of Sheboygan, who are Milwaukee Chapter members, came to Milwaukee to attend the November meeting.

At this time the officers, together with the publicity department of the Milwaukee Chapter, wish the members a very Merry Christmas.

*Editor's Note: See page 16 of this issue for reprint of paper on "Helical Gears."

RACINE

T. J. Santry, Chapter Publicity Chairman
1615 Racine St., Racine, Wisconsin

Exactly ninety-five Tool Engineers and guests attended the November dinner lecture meeting of Racine Chapter, American Society of Tool Engineers, held at Hotel Racine on the 15th. Dinner was served at seven o'clock and the lecture commenced at eight o'clock.

The main speaker of the evening was Mr. William A. Hart, Chief Engineer of the Colonial Broach Company, Detroit, and his subject was "Broaching and Broaching Equipment." "Bill" Hart, as he is known generally, is a Founder Charter Member of the A.S.T.E. and has served the Detroit Chapter in many official capacities.

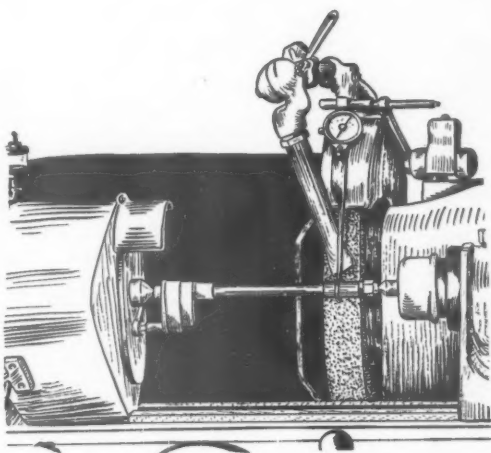
During his talk, which was very interesting from beginning to end, he stated that during the last several years the broaching process has gained considerable recognition as a manufacturing operation and during this time many problems have been met in the successful application of this method. He also explained the history of broaching, its past accomplishments, what wonderful results are being obtained in machining parts by this method at the present time and what future possibilities are anticipated.

(Continued on Page 34)



• USE LANDIS GRINDERS •

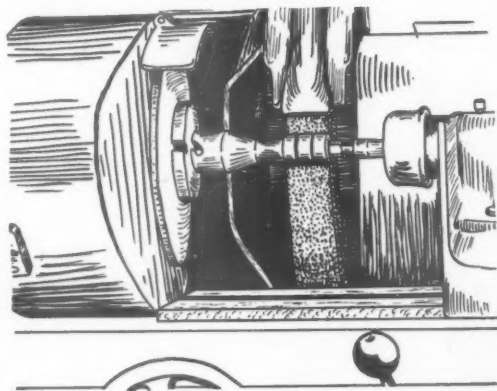
*Turning them out
in a hurry*



We present, on this page, two interesting examples of high output being secured by a user of Landis 6" Type C Plain Hydraulic Grinders.

Finish grinding the outside diameter of gear blanks (the upper illustration) 600 are produced per hour. Material is cast iron. Stock removal is .010". Limits are .001" for size and .001" for run-out. 2000 blanks are ground per dressing of the wheel.

The pump body illustrated below is ground at the rate of 300 per hour while 600 are ground per wheel dressing. Stock removal is .025". The limit for size is .002". Material is cast iron.



Obviously, if closer limits had to be maintained the production would not be quite as high. The point we want you to remember is that the Landis 6" Type C Plain Hydraulic Grinders are not only capable of such outputs as this, but they are also capable of grinding work to a high degree of accuracy. Our files contain many examples of both high output and accurate output and there is nothing our representative would sooner do than discuss them with you.

247

LANDIS TOOL CO.
WAYNESBORO, PENNA., U. S. A.

HANDY ANDY'S ..WORKSHOP..

Sitting in at the recent Director's meeting, I was quite impressed with the phenomenal growth of the Society during the past year. While all of the Directors were not present, those that attended represented quite a lot of territory, enough to prove that the A.S.T.E., first in its field, has served its membership, and industry, remarkably well. It is growing

because Tool Engineers throughout the land are sold on the merits of the Society.

The men present at the meeting have long since reported to their respective chapters, have given their impressions of the work and functioning of the Board. And, I daresay, their reports reflect favorably on the body as a whole. For, we come to the meetings with various problems, some pertinent to individual chapters, most bearing on the National Society. All are discussed, each resolved or com-

promised. The impressions of the various Directors, then, must be that the group is mutually considerate, that the spirit of the meetings is quite cooperative.

My personal impressions confirmed those of previous meetings, that the men selected are working for the good of the Society. That several old faces appeared indicates that the repeaters did a good job the first time. Zerkle of Cleveland, capable and friendly at first impress, improves on acquaintance, for if a staunch champion of his home town he is also keenly alive to the fact that, mutually, we are building the best engineering society on earth. Watch us grow!

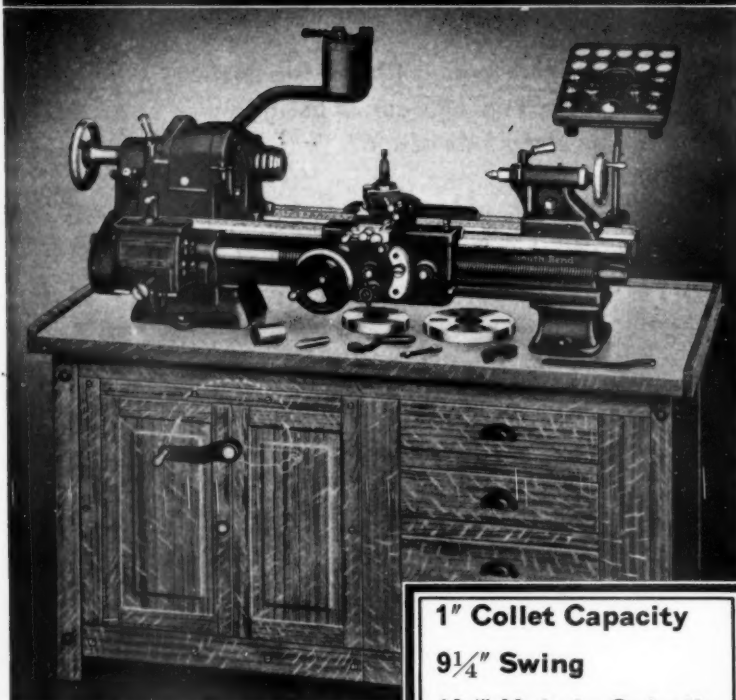
Smart of Milwaukee is a seasoned veteran now; he, with Johnson and Rademacher, reminded me of the Three Musketeers. "One for all and all for one," like, working hard for their own Chapter but considerate of mutual rights. Otto Winter, experienced by former directorship and Chapter chairmanships, fully justified Buffalo's choice. Otto gets things going, keeps 'em moving. Keep it up, Otto.

L. E. Renell, pinch hitting for Toledo, should be remembered another year; however, we hope that the regular electees will go to bat during their tenure of office. Weaver of Pittsburg and Blu of Chicago took hold like old timers, got right into the game and went to work. A. C. Goddard, an old timer now, smiles his way to his ends and gets there. A good choice was Floyd Eaton of Detroit. Somehow, we pick workers, and Floyd meets all expectations. One chap that rather warmed my heart was Dickett of Rockford—he was so utterly friendly—who somehow convinced me that I should be living in his neck of the woods. Maybe I'll visit some day.

I haven't said so much about the Old Guard, but they were there, too. To Detroit must be accredited the fact that it has borne the brunt of organization; its aim has been the growth of the Society rather than Chapter competition. There is plenty of midnight juice burned at headquarters between meetings. So far, Ford Lamb has earned his salt as Executive Secretary, to say nothing of those who rate no salt. Frank Shuler, quiet on the surface, is a good organizer and inspires enthusiasm; for that matter, the middle name of the entire Executive Board

(Continued on Page 32)

New South Bend 1" Collet Lathe



9 1/4" Swing by 3' Bed Quick Change Gear, Underneath Belt Motor Drive Bench Lathe complete as shown above, with Draw-in Collet Chuck, 8 Collets, Collet Tray, 1/4 H.P. Motor, and Electrical Equip. \$656.50 ment. Wt. 680 lbs. L.o.b. factory.....

THIS new 9-inch lathe is a back-geared Screw-Cutting lathe with all engine lathe features, and is recommended for the manufacturing plant and the tool room. Draw-in Collet attachment available in Hand Wheel Type and Quick Acting Lever type. Six tool bed turret and Double Tool slide adapt lathe to multiple operation manufacturing jobs. Telescopic Screw Type Taper Attachment and other attachments also available.

SOUTH BEND LATHE WORKS
994 East Madison Street, South Bend, Ind., U. S. A.

1" Collet Capacity

9 1/4" Swing

1 3/8" Hole in Spindle

Priced \$387 and up

Write **FOR NEW CATALOG**

Catalog No. 97 illustrates, describes, and prices the new 9-inch South Bend Large Spindle Hole Lathe in Underneath Belt Motor Drive, Pedestal Adjustable Motor Drive, and Counter-shaft Drive Types, and in 3', 3 3/4', 4', and 4 1/2' bed lengths. Copy sent free, postpaid.



SOUTH BEND Precision LATHES

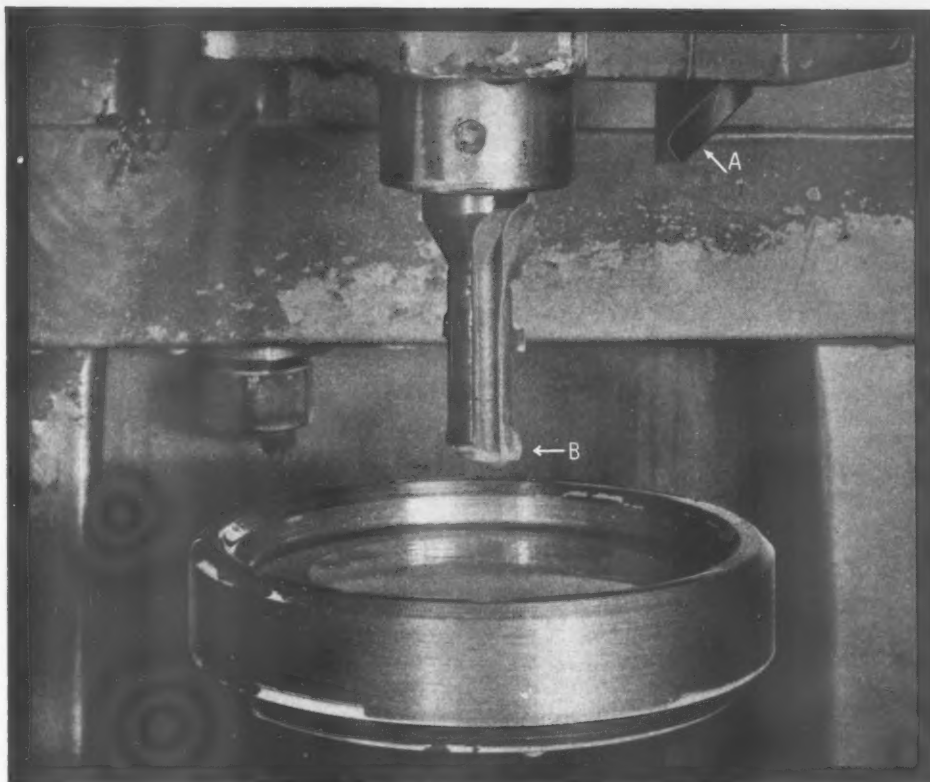


Photo. Courtesy Buick Motor Company

Machining operation on driving unit involving multiple diameters. Material: Forging S.A.E. 4640, Brinell 187-207. Operations: Chamfer I.D. 4.429" with V-R, Grade E, (A in photograph) while boring double diameter (.740"-.790") with H.S. Steel (B in photograph). Performance of V-R, Grade E:

Tool Material	Feed	Depth of Cut	Speed	Pieces per Grind
V-R Grade E	.0035"	1/8	340 S.F.M.	800

Every shop man knows the problem involved in machining multiple diameters in a single operation.

Here, again, Vascoloy-Ramet, the tantalum carbide tool material, demonstrates its superiority as a time and money saver, by its efficient operation at the high speed (340 S.F.M.) on the 4.429" diameter necessitated by a satisfactory boring speed on the .740" diameter.

Produced in 17 standard grades of different tantalum carbide content,

strength and hardness, V-R alone covers the entire range of machinable materials and machining needs.

It is unrivaled in the machining of all steels from the softest to the toughest alloys. Its performance on cast iron, semi-steel and non-ferrous metals is exceptional.

"A Grade for Every Use" may be the solution to the machining problems in your plant. Send for the V-R Catalog price list.

VANADIUM-ALLOYS STEEL CO.
VASCOLOY-RAMET DIVISION, NORTH CHICAGO, ILL.

VASCOLOY-RAMET

... The TANTALUM CARBIDE TOOL MATERIAL ...



A GRADE FOR EVERY USE

Mention "The Tool Engineer" to advertisers THE TOOL ENGINEER FOR DECEMBER, 1937

VASCOLOY-RAMET BLANKS

Vascoloy-Ramet is available in three forms, (a) completely finished tools, (b) milled and brazed tools, and (c) blanks. V-R blanks are furnished in 5 standard styles and in sizes to meet every requirement. To make tools with V-R blanks is a simple operation, fully described in a new instruction booklet, available free—upon request.

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St. Louis Mo.
Buffalo N. Y.
Philadelphia Pa.
Newark N. J.
Knoxville Tenn.
Los Angeles Calif.
San Francisco Calif.

Handy Andy's Workshop

(Continued from Page 30)

is WORK. Nor must we forget the good work done by Roy Bramson, publisher of "The Tool Engineer," who just dots the landscape with new Chapters. Another quiet chap who gets things done.

As a windup to the Directors' meeting, the Borthers Goodson, both enthusiastic A.S.T.Eers, put on a show and spread for the boys. Too bad some of the out o' towners had to leave early, for it was great stuff. Reminded me of old times at 31

Melbourne St., when an evening of hard work was topped off with tempting viands and . . . Well, eat, drink and be merry, for tomorrow—we put on a show.

Yes, that's right. We're going to have a show. It was regularly moved and supported, and motion carried, that at the annual meeting to be held in Detroit in March, the Society would hold a three day session of TOOL Engineering programs including an industrial show and plant visitations. So, we've set the ball rolling, and now it's up to

you boys North East West South to pep 'em up. For, with any kind of response we can show the world what makes the A.S.T.E. tick. The watchword is enthusiasm.

From one thing to another, I wonder if there's anything to the allegation that A.S.T.Eer Hasselquist of Rockford is threatened with prosecution by the S.P.C.A.? It seems that Mr. Hasselquist went fishing, and sorely vexed at the small size of the catch (they use codfish for bait where he hails from) he decided on bigger game. So he hooked a bull by the—uh, where did you say he hooked it, Dickey? Anyway, the bull didn't like it very well, or the line broke, or something, and Hasselquist neglected to pull the hook out. No fair.

Speaking of outdoor sports, I recall the time we moved into a new home back east. It was a suburban section, the places ranging from an acre or so up to plenty, and fairly close to the salt water. The very first evening, while looking around the grounds, I saw two ducks quartering toward the place. "Ducks!" I streaked for the house, grabbed the old musket and let fly into the tail feathers of the hindmost. "D—n!" It faltered, recovered, went on, lost in the dusk. About a year later, a neighbor remarked: "You know, I can't figure out whatin'ell happened to a duck we ate for supper last night. I chopped the head off it, but dang me if that critter warn't so full o' birdshot we nigh busted our teeth on 'em." "Oh?" a great light dawned. "What sort of a duck was it?" "A Muscovy. They fly, you know, and maybe somebody mistook it for a wild one." If neighbor Horton reads this—he might—he can venture a shrewd guess as to how 'the birdshot got into his duck.

From all reports, I missed out plenty by not attending the Detroit A.S.T.E. Speakers' Club gathering the evening of November 16th. It seems that they regaled the guests with Scandinavian "Smorgordsbord," and the idea took hold in a big way. The innovation, no doubt inspired by the fertile brain of A.S.T.Eer Auge Ketelsen (Chairman of Arrangements and, incidentally, the guy who chases tigers 'n' things up trees) may become a regular feature at future meetings. Anyway, that stuff goes to the right spot. H.A.

Announcing—

The ROBOT GRINDER



- Over a quarter of a century's experience in the manufacturing of precision machinery has enabled us to develop a high speed advanced type surface grinder for greater efficiency and more production.

Featuring:

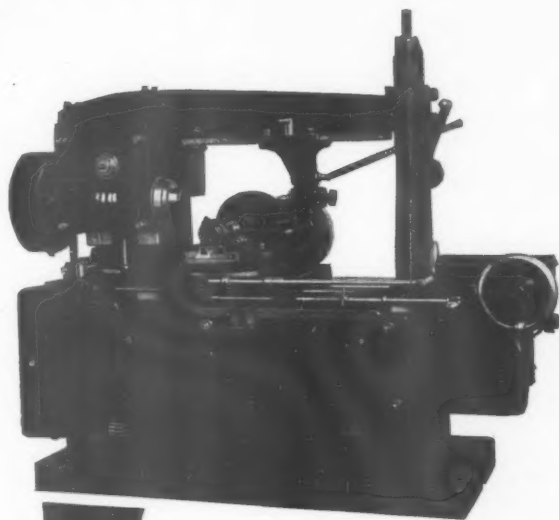
- 1 Materials of the highest quality obtainable, properly seasoned and machined with the greatest of accuracy.
- 2 Our advanced method of surface scraping and fitting assures you of a thoroughly precisioned table for all of its movements.
- 3 Covers have been provided for all bearings and other working surfaces that may come in contact with dust and grit. This insures against the accumulation of any waste, thereby eliminating excessive wear.
- 4 We have eliminated all cross belts having a Direct Drive to insure free movement and reducing all unnecessary friction, thereby giving those parts much longer life with the continued use of the machine.

For greater efficiency and increased production see the ROBOT GRINDER. Descriptive literature sent upon request.

ROBACZYNSKI MACHINE CORPORATION

BARBER-COLMAN HOBGING MACHINES

Go Right to Work



Above—Type A Hobbing Machine as shown on page 246 in our Catalog K.

Below—Type A Hobbing Machines photographed at work in a large automotive plant.

Money invested in Barber-Colman Hobbing Machines starts coming back promptly because the machines almost invariably go right to work as soon as they are installed. Often the customary demonstration is unnecessary. When special hobbing or any other reason indicates that a demonstrator is needed, a Barber-Colman expert is on the job as soon as the machine is supplied with power. In addition, inspectors are calling constantly at shop after shop to be sure that Barber-Colman Hobbing Equipment is rendering all the service of which it is capable and to cooperate with Barber-Colman customers in the most effective use of hobbing to increase net profits.

Barber-Colman Hobbing Service is complete. It is founded on experience in designing and building hobbing equipment that goes back some 30 years, that includes many original and basic improvements, that goes forward steadily in step with manufacturing practice. It includes Machines in a variety of sizes and types, Hobs with ground or unground tooth forms, Engineering that is safe and sound, Inspections that maintain productive efficiency.

Check over your manufacturing operations to see if you can begin to use the hobbing process or improve your present equipment. If in doubt—consult our Engineering Department. If you can use one or more Barber-Colman Hobbing Machines—they will go right to work earning profits for you.



PRODUCTS

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HOB, HOBGING
MACHINES, HOB
SHARPENING MA-
CHINES, REAMER,
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Dumser & Schroeder
610 West Michigan St.

Chapter Doings

(Continued from Page 28)

Mr. Hart's lecture was supplemented with picture slides, and an exhibit of tools, models of machines and machined parts. Practically all of the picture slides first covered a detailed print of the part to be broached and its operation, and after he explained this, he would follow it up with a picture showing the type of machine used, fixtures, tools, etc. Of particular interest were slides showing dual ram hydraulic surface broaching machines rang-

ing from six to twenty-five tons in capacity and with strokes of from 36 to 60 inches. This was designed for multiple operation broaching and for high production of heavy cuts and the two rams, which travel in opposite directions, can be used in a variety of ways. Various jobs were shown being broached and one of particular interest to the engineers showed the broaching of a segment gear for a washing machine. The teeth were cut in one pass of the broach, a distance of $1\frac{1}{4}$ ", depth of tool $\frac{3}{16}$ ". This was a high speed job done on a horizontal

hydraulic Broaching Machine and the production averaged 180 pieces per hour at a speed of 25 feet per minute."

Questions were asked from the floor at the close of the meeting which Mr. Hart answered ably and in the detail.

*Editor's Note: Mr. Hart's lecture was published in the July and August issues of "The Tool Engineer."

ROCKFORD

Herbert O. Olsen, Chapter Secretary
1016 Seventh Street, Rockford, Ill.

Our Beloit representative on the membership committee, C. W. Hess, has hung out his shingle on a new machine shop.

H. C. Sandell of Ingersoll Milling Machine Co., Chairman of our Membership Committee, has been seriously ill, and has our sincere wishes for a speedy recovery.

The boys at Sundstrand Machine Tool Co. have been hearing a good deal about Gunny Hasselquist's fishing accomplishments. Recently he "hooked" a cow.

New members have increased the list of companies represented in our membership to 29. New firms now included are: Allis-Chalmers Mfg. Co. (by local representative), Howell Electric Co. (by local representative), Atwood Vacuum Machine Co., McHugh Bros. Co., Micro Switch Co., Rehnberg-Jacobson Mfg. Co.

TOLEDO

Walter Ulrich, Chapter Publicity Chairman
2335 Cherry Street, Toledo, Ohio

When we were only a month old, our neighboring city's Detroit Chapter rode into town rough shod and called Toledo a suburb of Detroit (for which we have forgiven but not forgotten).

Now last week we journeyed to Detroit, seventy-five strong, expecting to be way in the minority, but on the check up we were nearly even. Not so bad for an eight months old baby chapter in the suburbs.

It was part of our job to escort the principal speaker, Mr. C. W. Spicer, to the meeting and furnish an operator for the camera he uses to illustrate his talk; and I hope Detroit doesn't hold it against us because Bob Haynes got a couple pictures in upside down, as he claims it was his first attempt at operating a slide camera.

All joking aside, every one had a swell time and we hope it won't be long before we can get together again.

(Continued on Page 36)

If
**YOU HAVE A
BORING JOB
THAT'S A HARD
NUT TO CRACK--**
try
**DAVIS BORING
TOOLS!**



**If you have a boring job that's
a hard nut to crack--**
try
DAVIS BORING TOOLS!

Have you an UNUSUAL Boring Job in your shop? One that's decidedly "different" or difficult—or that's costing you too much by present methods?

If so, we sincerely urge you to investigate at once the full possibilities of SPECIALLY-DESIGNED Davis Boring Tools.

In hundreds of shops—under all sorts of conditions—Davis Boring Tools have invariably brought about faster production, better work, lower costs. Some of our specially-designed, single-purpose tools have saved as high as 75% in boring time, besides producing better work!

Send us prints of your work, and let our Engineering Department make YOU a specific, money-saving recommendation. No obligation. Write us today!

**DAVIS BORING TOOL DIVISION
LARKIN PACKER COMPANY, INC.
ST. LOUIS, U.S.A.**

DAVIS BORING TOOLS

See that Flat!

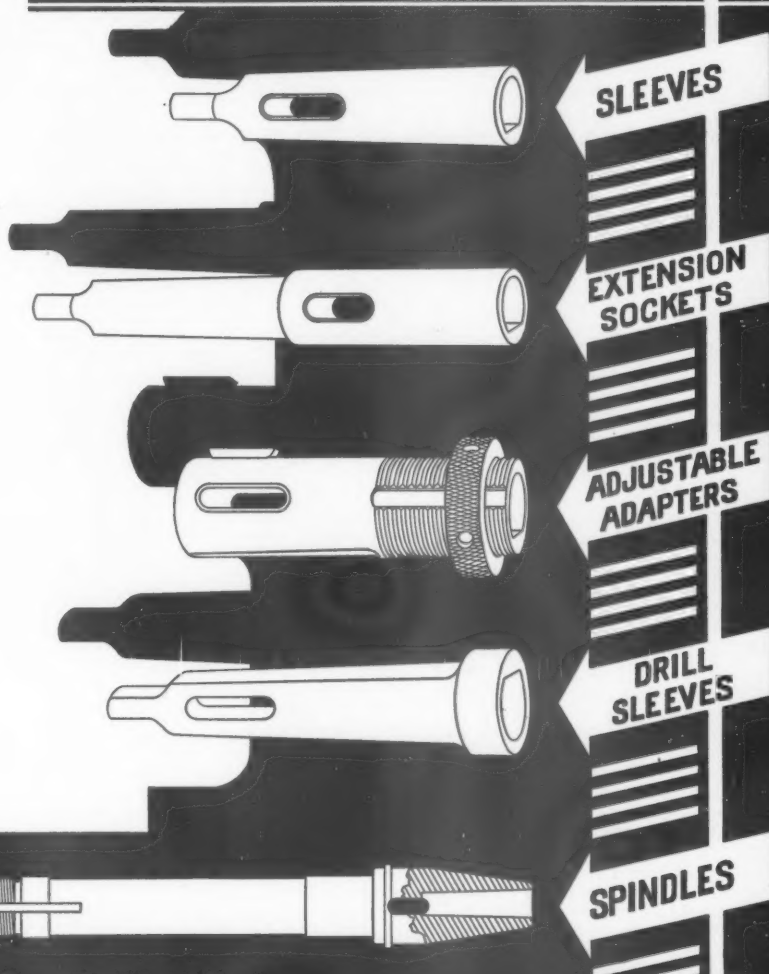
DRIVES THAT ARE *Positive*

With the present High Speed, High Production of today, you must have efficient, positive drives. The Scully-Jones "Use-Em-Up" drives were designed for this purpose.

Our new methods of manufacturing this drive provide it with the same accuracy as other drives, plus —the added MODERN-POSITIVE features.

Design your new tools to incorporate the Scully-Jones "Use-Em-Up" drive and discover the remarkable difference they make.

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For detailed information and prices, ask for Standard Tool Catalog Number 105 . . . For suggestions and examples of their application to Special Tools, request Catalog Number 200

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CHICAGO, ILLINOIS

*Scully-Jones
"Use-Em-Up"
Drives*

MANUFACTURERS OF QUALITY PRODUCTION TOOLS

Chapter Doings

(Continued from Page 34)

TWIN CITIES CHAPTER

M. H. Potter, Chapter Publicity Chairman
Dunwoody Institute, Minneapolis, Minn.

This being our first attempt at the publicity game, we ask your kind indulgence if we don't meet the high standard of other contributors. But we are here to tell the A.S.T.E. world that we had a "bang-up" good meeting to start off the fall season.

Fifty-five members and visitors

attended a dinner meeting at the Minnesota Union Wednesday, Oct. 27, to discuss important matters of business and to hear George A. Bouvier, director of engineering in charge of production engineering and methods for the Minneapolis-Honeywell Regulator Company.

Mr. Bouvier started out by claiming that he had been taken by surprise by the large attendance. When asked to speak before the T. E. group, he had asked how many members the organization had. Told that there were fifty-four members,

he decided he would have about ten at the most to whom to speak. At least that was the percentage that turned out to the organizations to which he belonged.


Mr. Bouvier's topic was "The Economics of Tool Engineering" and he presented a very interesting discussion on some of the high points of wasteful production as well as some valuable suggestions for economical production. We are looking forward to hearing Mr. Bouvier give us another talk expanding the same subject.

Mr. Pennington, our Chairman of the program committee, reported that the committee has been assured of the hearty cooperation of speakers representing the following firms: Lincoln Electric Co., Oliver Instrument Co., Gisholt Machine Tool Co., Firthite, Jones and Lamson, Carborundum Co., Barber-Colman, Warner and Swasey, and Carboloy. Looks as though we are in store for some interesting programs this winter.

Mr. Roby, our president, tried to pull a "fast" one by calling for a general election in October, six months ahead of schedule. He claims that he understood he was elected for a short term. However, he didn't get away with it and now realizes he is stuck until April—whether he chooses or not.

It's a tough job dodging Mr. Widen. He's a regular bloodhound when it comes to seeking out money for dues. He doesn't do so badly at the banquet table either!

We were all sorry to hear that our Treasurer, Mr. Hule, has been ill with the flu for the past three weeks. We extend to him our wishes for a speedy recovery!



PRECISION PAYS

ESPECIALLY WHEN YOU MEASURE IT IN PRODUCTION MINUTES

DANLY DIE MAKERS' SUPPLIES are made to the same type of standards as Danly Precision Die Sets to give better service and save time.

In Danly Dowel Pins, Cap Screws, Springs and other items you find close accuracy in manufacture, and other qualities that mean money saved in their application and in their use.

Dowel pins accurate to $\pm 1/10,000$ and of uniform straightness end to end.

Knurled Socket Head Cap Screws are driven home faster and easily locked.

Stripper Bolts are absolutely accurate in their standards and will not work loose.

Springs coiled from the special key-stone section wire, with strength and clearances uniform inside and out.

Precision Guide Posts and Bushings—are the same as used in Danly Precision Die Sets.

Clamps of Forged Steel for less than the cost of a plain steel block can be cut to size and drilled.

Precision Pays—Specify Danly Die Makers' Supplies on all your dies and tool work.

Danly Die Sets and Die Makers' Supplies from the 8 Danly Branch Office Stocks.

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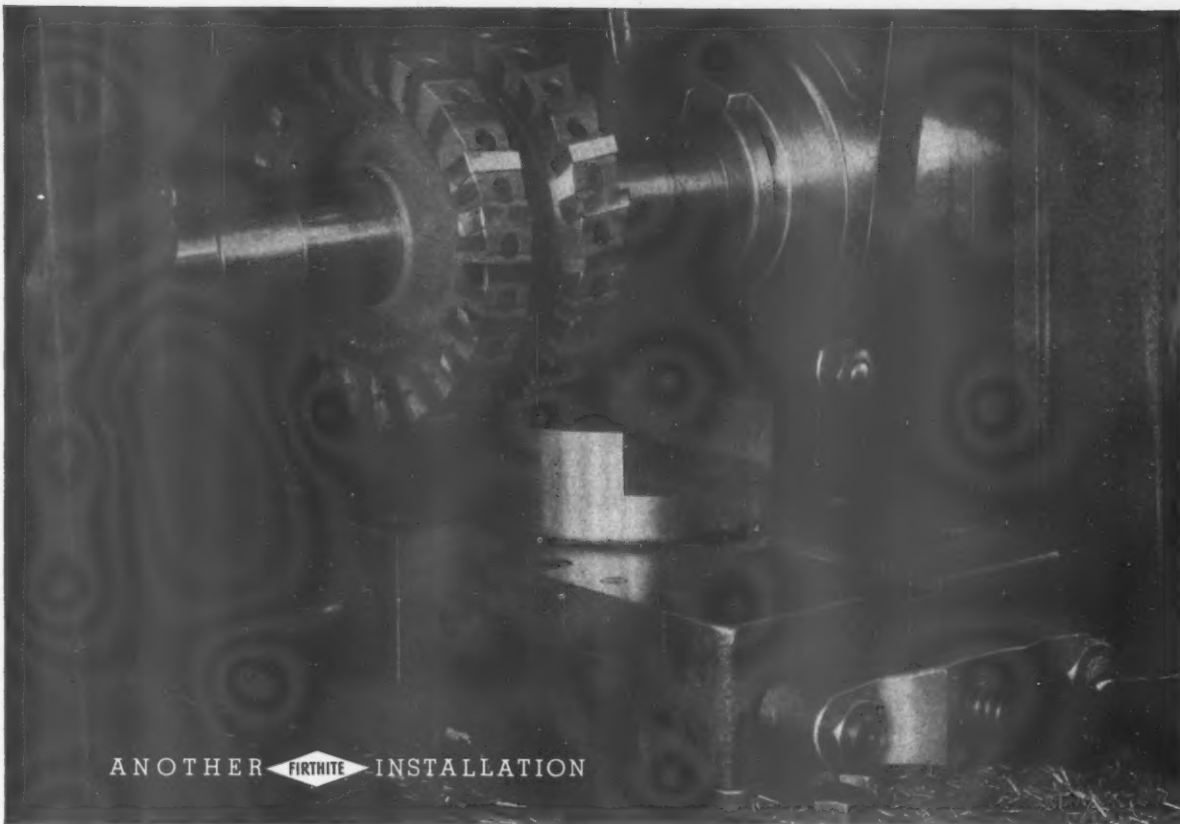
DANLY

DIE MAKERS' SUPPLIES

Philadelphia Likely To Have Next Chapter

Philadelphia Tool Engineers already have a sufficiently large group to apply for a charter to National Headquarters of the American Society of Tool Engineers.

However, the approaching holidays, and the recent hunting season were a deterrent to immediate installation of this chapter. It has been felt by the Philadelphia Committee that it is best to hold their installation early in January. This committee, headed by Conrad O. Hersam, 1609 St. Paul Street, Philadelphia, will be pleased to hear from any Tool Engineers of the Philadelphia area who are interested in affiliating with this new chapter.



ANOTHER  INSTALLATION

◆ FIRTHITE ◆

ANOTHER PROFIT MAKING INSTALLATION

Cutting semi-hard cast iron couplings on a Milwaukee Simplex. FIRTHITE tipped cutters take one cut where formerly two were necessary.

Speed of 225 Feet per min.
Depth of cut 1/8 inch.
Table feed 17 inches per min.
Production almost doubled.
Finish improved.
Tool life increased.

FIRTHITE cutters can be operated at cutting speeds high enough and chip loads per tooth low enough to finish fragile parts in one cut, maintaining both accuracy and finish.

Consult us for specific information on possible FIRTHITE installations in your shop.

FIRTH◆STERLING

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Works: McKeesport, PA.
NEW YORK CHICAGO
HARTFORD PHILADELPHIA
LOS ANGELES DETROIT
CLEVELAND DAYTON
GLOBE WIRE DIVISION
McKeesport, PA.

Production Perspectives

(Continued from Page 18)

looking to railroads for business. Indications are that equipment for the oil fields will be bought less freely than it has been during a large part of this year.

The Smith and Wesson Company of Springfield has received a sub-

stantial order from a foreign government, requiring the company to increase its working force to handle the additional output, it was reported by the company president, Harold Wesson. He said he was not at liberty to disclose the name of the country making the purchase or the size and value of the order, but by

locating it in South America, he gave assurance that the country is not one of those now at war. Several months will be required to complete the order, according to Mr. Wesson, and the working force at the plant will be stepped up gradually.

Higher labor costs, together with a strike in July of this year, are blamed for a reduction of \$19,511 in net profits of the Van Norman Machine Tool Company of Springfield.

Considerable new plant equipment has been installed recently in Western New England on orders placed early in the season. Among the concerns making such additions are the Westinghouse Company, Chapman Valve & Manufacturing Company, Springfield, Worthington Pump & Machinery Corporation, Holyoke and Jones & Lamson Machine Company of Springfield, Vt. American Writing Paper Company, Holyoke, is doing considerable to modernize its facilities and the new Shawinigan Company at Indian Orchard is installing much machinery.

Electric Game Company, Inc., of Holyoke, is expanding its production, pursuant to a national advertising campaign and has opened a new plant at Holyoke, where its electric baseball and football games are being produced for sale to department stores and other customers.

The Loring Manufacturing Co. of Worcester has installed a new automatic lathe manufactured by the Goodspeed Machine Co. of Winchendon. This new lathe, driven by a five horsepower motor, can turn out as high as 120 small pieces a minute and in manufacturing handles, its production runs between 30 and 40 a minute.

John G. Sandstrom, president of the Sandstrom Grinding Wheel Co. of Springfield and Mrs. Sandstrom, observed their silver wedding anniversary recently with a family dinner.

Frank Henry Sleeper, 75, president of Sleeper & Hartley, Inc., wire machine works, Worcester, died Nov. 5 in St. Petersburg, Fla., after an illness of about a week.

Tage Wickermentz of Stockholm, Sweden, is in Worcester studying the manufacturing methods of the Heald Machine Co. Mr. Wickermentz is a representative of the A. B. Servus Co. of Stockholm which represents twenty-five American machinery manufacturers in that country.


Norton Co., Worcester, was host

(Continued on Page 47)

DO ALL

ON SHAPER OPERATIONS

CONTOUR SAWING
FILING and
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"Industry's
Newest
Cutting Process
and Most
Versatile
Machine
Tool."




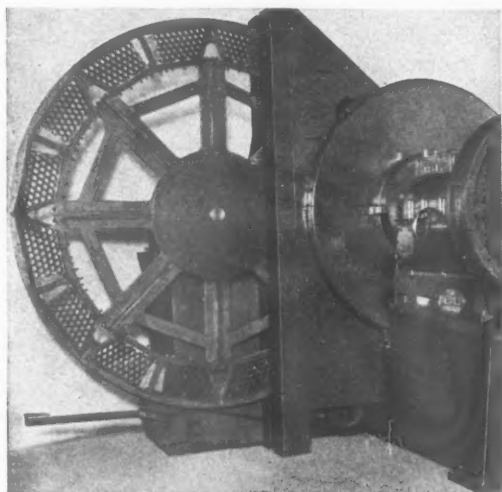
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Send for FREE
Case Record Book
describing methods
that CUT COSTS



**CONTINENTAL MACHINE
SPECIALTIES, INC.**
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OUR 45 YEARS EXPERIENCE building Disc Grinders and Abrasive Discs is reflected in results enjoyed by users of our product.



We built the first Disc Grinder at our Beloit, Wisconsin Works, 45 years ago, starting with a very simple machine employing ordinary Emery Cloth Discs. Grinding 2500 valve springs per hour—putting piston rings through a Besly at the rate of 400 passes per minute, are examples of what can be done with a modern Besly Grinder using Besly Titan Resinoid Bonded Steelbac Abrasive Discs up to 3" thick. These discs so widely known and copied are standard in most "up to the minute" plants. Not only have they improved the results from Disc Grinders, but they are being used to wonderful advantage on Blanchard, Pratt & Whitney, Osterholm, Diamond, and similar machines.



Write us concerning your flat surfacing problems. Our long varied experience will be helpful in suggesting proper equipment.



[Write for your copy of Booklet
 on Besly Titan Steelbacs.]



CHARLES H. BESLY AND COMPANY

118-124 NORTH CLINTON STREET



CHICAGO, ILLINOIS

Effect of Design

(Continued from Page 15)

well as on the part of the worker is that of efficiency.

It is true that machine tool styles can hardly be placed on a yearly basis as are automobiles. For instance, lathes, grinders, presses and the thousands of automatic tools, large and small, are expensive, and by and large their use does not warrant style changes incident to passing fancy. Mere style is not an essential and in the second place the money outlay inhibits frequent renewals. But, regardless of these facts it cannot be denied that industry is undergoing what may be termed a major event in face-lifting. Markets and competition dictate acceleration in production and lowering of prices. There is an unmet demand for higher efficiency and engineers lit-

erally lie awake nights in an endeavor to solve the changing problems of our machine age, whose only solution lies in tools.

The result is that executives seek outside aid in the redesigning and styling of the products of their factories. They realize they are stymied by trade regulations and tradition and it has been difficult for them to apply the beauties of line and form so easily developed in two dimensional concepts to the actualities of their three dimensional products. They want to break away from precedent and standardized design.

They are not blind to the potentialities of eye appeal in opening markets and increasing sales for machines and tools as well as the products thereof. They realize that buyers and users take as keen interest in smart, attractively styled

tools as they do in their clothing. They also realize that the grouping of parts to create an atmosphere of simplicity, and actual reduction in working parts, are vital sales weapons in the hands of a good sales manager.

Accordingly, considerable study has been given to every phase of machine tool production including the simplification of castings for the removal of bumps and humps. The way has been paved for giving masses of metal a decorative theme or imparting a direction of flow of component parts to simulate unity or effect congruity. Obviously in the restyling of castings for external appearance values, analysis and readjustment of working internals is often necessary. Again there is the matter of new materials and new alloys which may make possible the development of lighter, more serviceable and more accurate tools and consequently their use may enter vitally into the sales picture.

Though in the past many mistakes have been made in the design of machine tools, progress seems to be on the right track now, for engineers and executives alike appreciate that it is not a problem of superficial design in adding lines or covering parts with boxes but the practical correlation of machinery and parts into an attractive, practical, functional whole. This is the new development that is having a far reaching effect factually in sales and in the work that men do.

The foregoing is not mere theorizing. Two practical examples of the value of tool design are found in a streamlined electric sander recently put on the market by a Chicago concern, and a streamlined tractor introduced a year ago by a Cleveland manufacturer. The sander is minus the protuberances that have characterized equipment of this sort, and in its streamlined aluminum shell it presents the appeal of attractive design, durability and service. The new style has enthused salesmen and distributors and it immediately catches the eye of the artisan as being a "damn fine tool." And he wants it because its design reflects those qualities. The tractor, heretofore has been regarded as a rugged, iron monster. Little thought was given to the redesigning and styling of this tool which has wide use in various industries, from agriculture to mining and timbering. Experiences in horticulture evidenced possible need for improvements. It

(Continued on Page 46)

GETTING RESULTS WITH GAIRING HOLLOW MILLS



Longer service life with fewer interruptions and infrequent replacement blades—that's what you get when you specify "Gairing Adjustable Blade Hollow Mills." Production moves along smoothly and speedily, which adds much to profits.

Whatever your cutting tool problems may be, consult Gairing Engineers. Recent improvements in hollow mill construction, developed by our engineers, are materially lowering cutting tool costs. We can be of great assistance to you in giving helpful advice on such problems.

Your local Gairing representative will be glad to tell you more about this service.

Catalog No. 30, illustrated, will be mailed to responsible parties upon request.

THE GAIRING TOOL CO.
1629-35 WEST LAFAYETTE • DETROIT, MICHIGAN



how

a well-known plant
SAVED 23%
on the Cost of
Cemented Carbides

... by Adapting their **CARBOLOY** Tools to the New Standard-Size Tips!



Typical example of simple changes necessary.
Dotted line shows tip formerly used.

Just a few strokes of the draftsman's pencil . . . a few minor tool design changes . . . and down went the cost of cemented carbide tools for a well-known manufacturer of brake drums, hubs and other automotive products. Same high-quality tool performance . . . at an average reduction of 23% in cemented carbide costs on 16 different styles of tools.

Here's how your plant can save also: Get Catalog M-37 showing the new standard Carboloy tips in 150 sizes, 3 styles. Check these tips against the ones you are now using on your present cemented carbide tools. Then . . . in every case possible . . . make a few simple changes in tool design and replace the more costly, special Carboloy tips with the new standard-size Carboloy tips. Usually, only a minor change, in no way affecting tool performance, is necessary.

Switch to the new standard-size Carboloy tips . . . and save from 15% up!

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Send free 28-page catalog showing economy of
new standard-size Carboloy blanks.

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Company _____

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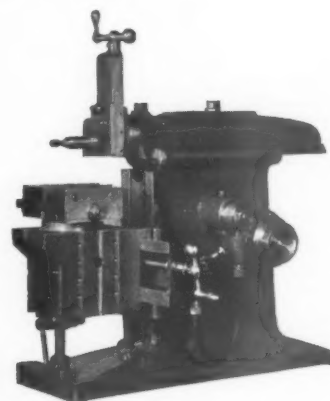
NEW Equipment

The Baldor Electric Company announces the development of a grinder, designed for the one purpose of sharpening Carbide Tools. This grinder is equipped with two wheels; one for roughing operations and one for finishing operations and is powered with a ½ H.P., reversible motor, so that either right-hand or left-hand tools may be sharpened

with the wheel always rotating towards the cutting edge of the tool. The grinder is designed to take a Silicon Cup wheel on the left-hand side, and either a Silicon Cup wheel or a Diamond Cup wheel on the right-hand side. Standard equipment includes the following: Tool rest tables 10" x 3½"; protractor at each end of grinder to indicate the angle of the tool table; light which may be swung over either wheel; tool supports attached to tool rest table; wheels are optional. For additional details write Baldor Electric

Co., 4357 Duncan Ave., St. Louis, Mo., mentioning "The Tool Engineer."

▼ ▼ ▼
The new Ammco 6" Crank Shaper meets the needs of machine shops and factories interested in a shaper that is small in size . . . low in price . . . but long in accuracy and range, it is claimed.



This small shaper can be mounted on a bench or is available already mounted on a portable workbench that can be rolled from job to job. This portable feature saves a lot of time and steps for the operator and puts the machine at the disposal of various departments in a shop.

This is an ideal machine for surfacing and finishing small castings of irregular shapes. It also is great for handling ordinary flat work that requires slotting or grooving, or for cutting keyways, machining out blanking dies, and is indispensable in the tool room.

Large shops will find this machine a valuable addition to larger equipment because they can actually set-up and complete many small jobs on the Ammco in less time than they can make a set-up on larger machines. This 6" Crank Shaper has ample speed for rush jobs, is accurate for close work, is ideal for small production—and handles a wide range of jobs economically and satisfactorily—leaving the big machines open for large, long run jobs.

Complete specifications and prices are available by mentioning "The Tool Engineer" to the manufacturers. Address the Automotive Maintenance Machinery Co., North Chicago, Ill.

▼ ▼ ▼
A new line of Heavy Duty Counterbores known as Spline Taper

(Continued on Page 44)

"LOGAN"

Gives You a
**CENTRIFUGAL
PUMP WHICH IS
SELF-PRIMING**



B

ECAUSE it is Self-Priming, The "Logan" Sure Flow is adapted to an unusually wide range of services. It pumps hot or cold liquids; and safely handles chips, filings, abrasives and most corrosive impurities. The "Logan" Sure Flow, with its vertical motor drive, simplifies installation and saves space. It can be mounted entirely away from the source of supply. No part of the pump need be submerged. No foot or check valve is needed in the line.

The "Logan" Sure Flow cuts installation costs, saves valuable space, steps up production and insures greater dependability in the most exacting type of service. Made in ten sizes—4 to 150 gallons per minute. Motor, adapter or belt drive. The new Sure Flow catalog No. 60 will be mailed on request. Write for it today.

LOGANSPORT MACHINE, Inc., Logansport, Indiana

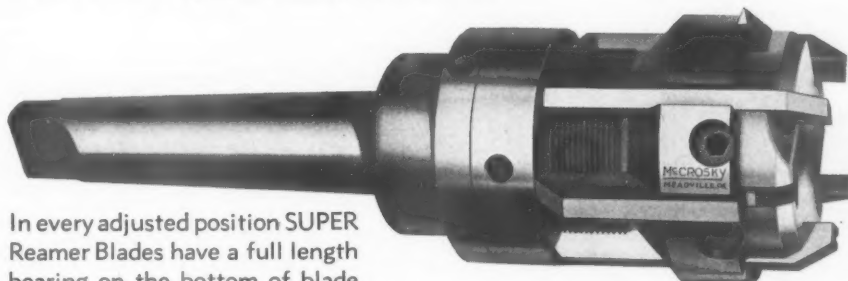
Manufacturers of Air and Hydraulic Devices, Chucks, Cylinders,
Valves, Presses and Accessories.

Improve Performance and Cut Costs

MODERN tooling tends more and more to tools specially designed to suit the conditions of each job. Such special-purpose tools have proved their value on limited as well as large production. McCrosky's tested pin and screw lock for holding inserted reamer blades is readily adaptable to special-purpose reamers. Shown below are examples of Special SUPER Reamers that cut costs by combining operations.

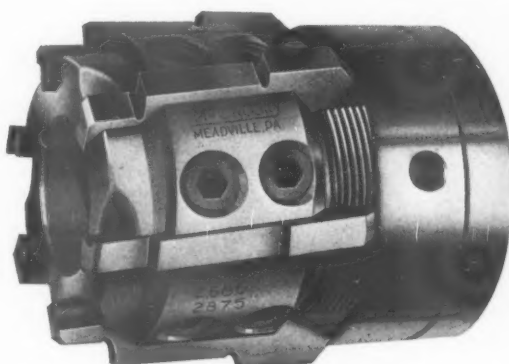
with Special-Purpose
SUPER REAMERS

Engineered to
the Job

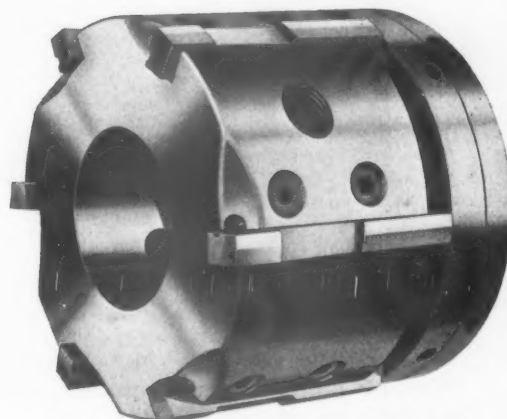


In every adjusted position SUPER Reamer Blades have a full length bearing on the bottom of blade slots

Special SUPER Machine Reamer reams, taper reams, faces, and chamfers



Special SUPER Shell Reamer reams three diameters and faces two shoulders



Heavy-duty SUPER Reamer roughs and semi-finishes in one operation

Special SUPER two-step Shell Reamer mounted on McCrosky Floating Holder



Your work prints will enable McCrosky Engineers to submit layouts of Special SUPER Reamers that can cut your costs.

Be sure your reamer reference file contains McCrosky Bulletin No. 15-A. It lists nine styles of standard SUPER Reamers, shows many examples of specials, and gives practical instructions on reamer grinding. Your request today will bring a copy by return mail.

McCrosky Tool Corporation, Meadville, Pa.

Sales Offices: Detroit, Chicago, Cleveland, New York, Philadelphia

New Equipment

(Continued from Page 42)

Drive Counterbores, is now announced by the National Twist Drill & Tool Co., Detroit, Mich.

This new design combines exceptional ruggedness of the drive, as well as of the tool itself, with permanent alignment of the Counterbore Cutter with its holder. Simplicity of design has been achieved to an exceptional degree as there are no loose pieces such as screws, pins or springs.

Hardened and ground alloy steel holders have been developed with the idea of long life and continued accuracy. Each Holder will accommodate a series of Cutters within its range. Interchangeability of Pilots has also been arranged for in the same way.

The Spline Drive Inverted Spot-facers also announced are companion tools to the Counterbores described above. These Inverted tools are useful for spotfacing or counter-boring surfaces that are inaccessibly

located. The Pilot is inserted through a hole and the Cutter can be attached by a small angular movement. Driving is accomplished by means of three Splines, located 120° apart. These Splines are integral with the Pilot. Corresponding spline surfaces are provided on the Cutter so that a thoroughly balanced three point drive results.

Standard sizes of these tools are carried in stock. Special combinations of Spline Taper Drive tools can be arranged.

Descriptive literature and price lists are available and can be obtained by addressing the Company's home office or branches.

A light weight, portable Brinell instrument that can be carried easily right to the job is said to simplify metal hardness tests in the field, remote from laboratory facilities and around industrial plants. According to the manufacturer it can be used in close quarters and can be applied to parts and equipment the size of which have, heretofore, made testing difficult, expensive and sometimes virtually impossible. It eliminates both the necessity of dismantling equipment to be tested and transporting specimens to the laboratory.



The P Mark of A BETTER GAGE

- Made or salvaged to the highest quality standards. Unexcelled in providing extreme accuracy and the maximum in long-lived performance.
- Made in the only gage plant in the Middle West operating its own chrome-plating department. Lincoln Park has the most modern chrome-plating facilities in the gage industry.
- Made by the pioneers—and now the largest users—of Carboloy in the manufacture of gages.

OUR NEW POCKET SIZE HANDBOOK of gages and gage standards is just going to press. Informative and extremely useful to every gage user. Reserve YOUR copy—TODAY!

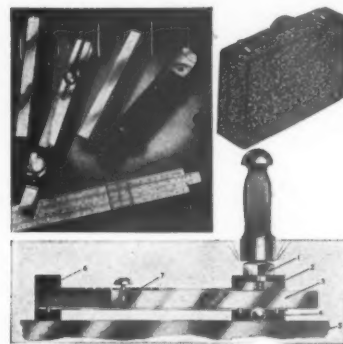
LINCOLN PARK TOOL & GAGE CO.

1723 FERRIS AVENUE ● LINCOLN PARK, MICH.

GAGES OF
STEEL
●
CHROME PLATE
●
CARBOLOY



SALVAGING
OF GAGES,
BURNISHERS,
ETC.
by CHROME
PLATING



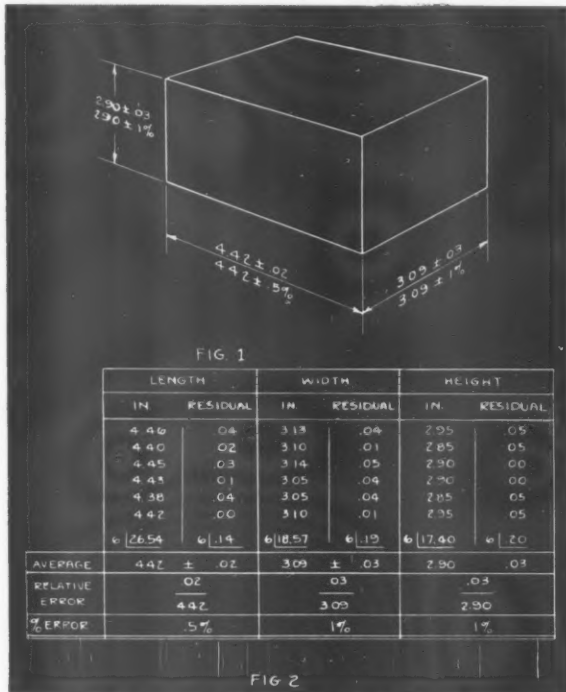
Known as the Telebrineller, the instrument was developed by one of the oldest and largest railroad rail maintenance organizations in the United States to check and control the re-building (welding) and heat treating of rail ends on the right-of-way. Its simplicity, convenience and the ease with which it can be carried are indicated by the fact that the combined weight of the outfit and carrying case is only 6½ pounds. According to the manufacturer it is not affected by hot or cold weather and is built to stand hard use. No training or previous experience, it is claimed, is necessary to operate it accurately.

(Continued on Page 54)

RELATIVE ACCURACY

By
Peter F. Rossman
Member A.S.T.E.

THE following is intended to assist in obtaining a clear conception of the relative accuracy of lengths, areas, and volumes when the given linear dimensions are expressed with a limit.



The block in Figure 1 is measured 6 times, the averages of these lengths are shown in Figure 2. The difference between the average length and the measurements is called residual. Average length = average residual is the dimension to be used in the mathematical computations.

The actual, relative and percentage errors are changed accordingly as the operations of addition, subtraction, division, and multiplication are involved.

When linear dimensions are added or subtracted, the actual errors are added.

This means that if several lengths were added, the result would be correct even if all the lengths considered were equal to the low limit, or if all were equal to the high limit.

If two dimensions having actual errors are multiplied, it becomes necessary to add the relative errors, or since the relative errors expressed as decimals are similar to percentage errors, it is better to use percentage errors.

A study of the following will show why this is true:

$$(A + 2\%) (B + 3\%) =$$

$$(A + 2\% \text{ of } A) (B + 3\% \text{ of } B) =$$

$$(1.02 A) (1.03 B) = 1.0506 AB = AB + 5\% \text{ of } AB = AB + 5\%$$

$$(A - 2\%) (B - 3\%) =$$

$$(.98 A) (.97 B) = .9506 AB = AB - 5\% \text{ of } AB = AB - 5\%$$

Since $(A + 2\%) (B + 3\%) = AB + 5\%$, and $(A - 2\%) (B - 3\%) = AB - 5\%$, it follows that $(A + 2\%) (B + 3\%) = AB \pm 5\%$.

$$\frac{A + 2\%}{A} = \frac{A + 2\% \text{ of } A}{A} = \frac{1.02 A}{A} = 1.02$$

$$\frac{B - 3\%}{B} = \frac{B - 3\% \text{ of } B}{B} = \frac{.97 B}{B} = .97$$

$$\frac{A}{B} = \frac{A}{B} \pm 5\% \text{ of } \frac{A}{B} = \frac{A}{B} \pm 5\%$$

$$\frac{A - 2\%}{B} = \frac{A - 2\% \text{ of } A}{B} = \frac{.98 A}{B} = .98 \frac{A}{B}$$

$$\frac{B + 3\%}{B} = \frac{B + 3\% \text{ of } B}{B} = \frac{1.03 B}{B} = 1.03$$

$$\frac{A}{B} = \frac{A}{B} \pm 5\% \text{ of } \frac{A}{B} = \frac{A}{B} \pm 5\%$$

$$\frac{A \pm 2\%}{B \pm 3\%} = \frac{A \pm 2\%}{B} \pm 5\% \text{ of } \frac{A \pm 2\%}{B} = \frac{A \pm 2\%}{B} \pm 5\%$$

*CHICAGO
*CLEVELAND
*DETROIT
HARTFORD
LOS ANGELES
MILWAUKEE
MINNESOTA
MUNCIE
NEW YORK
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There is a type for every requirement. Send for Catalog.

In every major industrial city, sixteen in all, there is a Federal branch office or sales agency ready to give you specialized co-operation on your precision measuring requirements.

At Detroit a complete stock of instruments and parts is maintained as well as a complete repair service, which complements the same service rendered from Providence.

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FEDERAL DIAL INDICATORS and GAUGES

Effect of Design

(Continued from Page 40)

was redesigned, streamlined and various mechanical changes made. The results are best told by the heading of an article by the financial editor of a Cleveland paper which read: "Tractor Business Best in Years—Cleveland Plant Finds Sales Boosted by New Streamlined Models."

Improved machine tool design has been proved to be the open sesame to new machinery business. It speeds up production. It speeds up sales. Through redesign we ring out the old, ring in the new.

Tooling in England

(Continued from Page 12)

opportunities there than here. British "Machinery" is always full of advertisements for help. Now don't all rush to go there—you would only make about five pounds or twenty-five dollars a week, and you would have to learn to project your drawings reverse, although Ford and Austin are trying to educate them otherwise. And it would probably irk you to have to design your job to make it so cheap and universal. Furthermore, you would run afoul of the British Labor Board for a permit to work, even, as aliens must

get into the immigration quotas to get into this country.

Working conditions are variable there. I think you will see conditions which are both better and worse than here. There are some wonderful social developments by some manufacturers, who offer homes in model villages, playgrounds and clubs for their help. There are also some awful dumps of factories, buildings 100 or more years old. Every shop of any repute has its canteen where workers can congregate for lunch, tea and recreation, and even shops of small size have their exclusive playing fields for cricket, soccer, or rugby for their employees. And everything stops for tea, in some plants, not once, but twice a day, at 10:00 in the morning and everywhere at 4:00 P.M. Office help pile into the canteen, while executives have tea served at their desks. Even salesmen who are calling on the purchasing agents are extended the courtesies of free tea wherever they may be, and shopmen have, right in their tool boxes, a canful of tea and a sack full of sugar. The lowest apprentice boys dole out hot water, probably into a can, and the workman stops for a minute or two while he makes and refreshes himself with a cup of tea. It is a nice custom and I can swear to its refreshing qualities.

The Ford Motor Company, when they established themselves with their American ideas of efficiency, forbade the practice. There was so much bootlegging of tea by workmen, regardless of consequences, that they had to adjust their change of shifts to 4:00 o'clock to meet the situation.

As a foreigner in England, I had a great experience. On my major job there, establishing British manufacture of tools formerly made in America, I quickly fell into the "Buy British" idea. England had been losing her markets abroad, but "Buy British" has met response everywhere. It is not because the Britisher feels he and his are superior, as I believe we can and do about American products. It was necessary for them to so do to continue. They have a lot of respect for America and Americans. The U.S.A. is regarded as their natural blood relative, who has left the parent and more than made good on his own. They regard us as a superior race materially, and everywhere a normal American is received with open

(Continued on Page 48)

1. Stronger Teeth

Improved Flute design permits heavier flutes with greater chip clearance.

2. More Chip Clearance

New cupped end and re-designed end-teeth prevent clogging of chips and resultant breakage.

3. Fast Spiral Design

WELDON

Double end, End-Mills

for

Improved Performance

GREATER CUTTING EFFICIENCY

PAT.
PEND.

Stronger teeth and more chip clearance, together with the regular WELDON hollow ground flutes, double back off and fast spiral, make this new end-mill 50% stronger and twice as fast cutting as formerly.

The WELDON TOOL CO.

321 FRANKFORT AVE.

CLEVELAND, OHIO

"Pioneers in Fast Spiral Double-end, End-Mills"

Production Perspectives

(Continued from Page 38)

to 32 visitors from Germany, representatives of the machine tool and abrasive industry of that country, recently. The party is on a good will tour that will take them into New England and the Middle West.

Employment by 25 industries in the Springfield, Mass., area reporting to the National Metal Trade Association slumped from 23,459 October 1 to 22,150 on November 1. Secretary A. R. Tulloch of the Western Massachusetts branch reports. Despite this drop of 1,319 workmen during the month, the employment report still was higher than on November 1, two years ago.

Four contracts for building additions have been awarded contractors by the General Electric Company, in Pittsfield, Mass., Superintendent Carl S. Dixon announces.

Connecticut

Although payroll statistics for October failed to show any marked decline in Connecticut's major industrial centers, a falling off of industrial production was clearly evi-

dent in Connecticut toward the close of October and became accelerated in November. Most mass production plants cut down the number of working hours instead of laying off employees. In some industries the downward trend was reversed due to the impetus of Christmas goods demand. Bridgeport's weekly average industrial payroll in October was \$1,207,964, a loss of less than one-half of one per cent as compared with September, according to the monthly business survey of the Chamber of Commerce. Machinery and machine tool business in October was definitely below expectations. The Bullard Co., Bridgeport, announced abandonment of plans to increase its capitalization by \$1,500,000, due in part to "uncertain conditions" in the securities market.

New Britain Machine Co., New Britain, has filed with the SEC its proposal to issue 15,000 additional shares. The issue is expected to net \$368,992.50, the balance being for underwriting expenses, including registration. . . . Leach Mfg. Co., Providence, R. I., has been selected by the creditors' committee as the successful bidder for the bankrupt business of Cornwall & Patterson

Co., Bridgeport. . . . The Bridgeport plant of Underwood-Elliott-Fisher Co. is now operating all departments four days a week after a shutdown of all but assembling departments. . . . General Electric Co., Bridgeport, has laid off few workers except in the radio department, where the seasonal peak has passed. Stanley Works, New Britain, has announced two additions to its line, a combination pocket flashlight and screwdriver and a steel wheel-guard to be used in garage doorways which forces the wheel away from the casement if the car is driven too close. . . . Segal Lock & Hardware Co., South Norwalk, reports a 16 per cent gain in consolidated shipments of hardware for the first nine months of 1937 compared with the same period last year. . . . Frederick W. Oldfield, 37, general superintendent of the Sessions Foundry Co., Bristol, died November 14 of a heart attack. . . . Raybestos-Manhattan, Inc., is now employing about 1,000 persons at its Bridgeport plant and about 5,100 in all plants. . . . Bodine Corp., Bridgeport, has been awarded a large contract for making special machinery to be used at the Frankfort Arsenal of the U. S. Army.



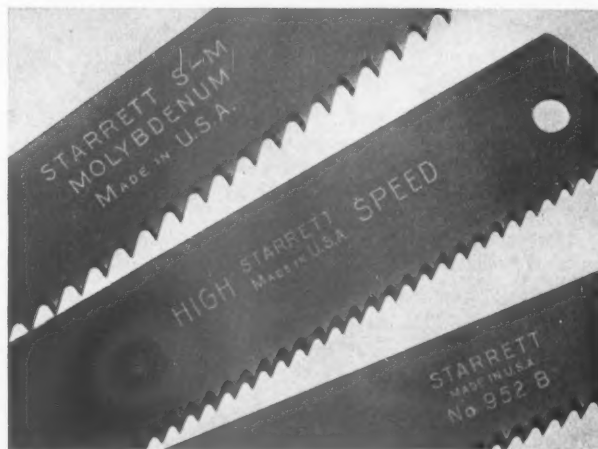
YOU GET WHAT YOU WANT WHEN YOU SPECIFY

STARRETT HACKSAWS

Starrett makes three kinds of hacksaws — Tungsten Alloy, High Speed Steel and S-M Molybdenum.

Starrett makes all three in a complete range of sizes for hand frames and power machines.

In other words, no matter what kind, type or size hacksaw you prefer, Starrett makes it and your distributor is almost certain to carry it in stock. Refer to Revised Starrett Catalog No. 25T when you want the one best hacksaw for any metal cutting job. Write for a copy.



THE L. S. STARRETT CO., ATHOL, MASS., U. S. A.
World's Greatest Toolmakers—Manufacturers of Hacksaws Unexcelled—Steel Tapes,
Standard for Accuracy—Dial Indicators for Every Requirement

Standardize on

BUY THROUGH YOUR DISTRIBUTOR

Tooling in England

(Continued from Page 46)

arms. They like to see us work and they like to hear us talk. As the tool supervisor at Ford-Dagenham used to say, "We think we are in the talkies when Weddell comes around." Every American who is working in England more than three months must have a labor permit, and to get it, must be vouched for by some British employer who swears that you are not keeping some Englishman out of a job.

I have mentioned the Defense Program which is so potent in England now. England had staked her future for peace on the League of Nations. It has proven ineffective

due to nonsupport by its members and others. Being on the border of continual war threats and tired of taking it from others, they have launched a huge program to defend their comparatively prosperous and tiny country. Realizing that the major threat of war is through the air, they have proceeded accordingly with elaborate air defense schemes. More planes, aviators and anti-aircraft defense is their prime consideration. Large production of aircraft has been set up by the establishment of so-called shadow factories. These, from their name, are new plants in the shadow of present makers of engines or planes. They are new, huge plants, government

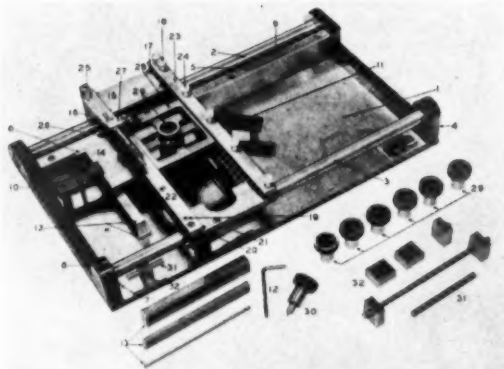
owned, but operated by the staff of the present neighboring plants, such as Bristol Aircraft, Rolls-Royce, Austin Motor. Each of these plants is equipped to make the whole motor or fuselage complete, but are primarily set for production of certain parts. The idea is that if any of the plants are bombed, the others can carry on the work wholly or in part. There are about ten different shadow plants scattered far apart all over England, so it would be pretty hard to destroy them all.

You see few soldiers in England—about the same as here—but there are many aviators in training in the Royal Air Corps. Every day you read of one or two who are killed in training, so they really must do some stunting.

The Aircraft Defense is brought home to each and every workman. In every plant, you see huge posters asking for volunteers. In Birmingham, a city of over a million population, they want nine thousand volunteers and another quota from Sheffield.

When you see all of these things it makes you stop and think of whether our progress has been worthwhile, whether our last war for democracy was not in vain.

Introducing . . .



THE MICRO-PRECISION UNIVERSAL JIG

The latest scientific engineering development to guarantee **GREATER ACCURACY, SPEED AND CONVENIENCE** in drilling and layout.

It permits setting up, laying out and drilling to accurate centers faster than anything you have ever used. Laying out accurate centers for 3-4-5-6-7-8-10-12 or 16 holes equally spaced in the circumference of a circle are as simple as A-B-C. From the nine advantages, listed to the right, you can see why this jig is so accurate, speedy and convenient. Its use in many of the largest industrial plants is ample proof of its ability to save valuable time of your expert machinists and tool makers. The Standard Model, capacity 14 x 8 x 2 inches, 10-Days Free Trial—\$185. F.O.B. Batavia. Larger Model, 14 x 12 x 3—\$215.

Write for Illustrated Leaflet T-E 1.

HENDERSON & KAYE
BATAVIA, ILLINOIS

Note These ADVANTAGES

- 1 Set up of flat work is a matter of seconds—Speed.
- 2 Center points quickly located with the two special micrometer heads.
- 3 The drill is supported and guided.
- 4 No layout lines required for drilling.
- 5 No special surface or edge preparation necessary.
- 6 Layout lines may be scribed in accurate relation to holes drilled on the same set up.
- 7 Layout lines may be light or heavy.
- 8 Does its own right angle layout work independent of any other means.
- 9 Gage rods held to less than $\pm .0001$ ".

Helical Gears

(Continued from Page 16)

workmanship. Such words as "harmonics," "resonance" and "sound amplification" are often used in connection with gear noises, but it is the speaker's experience that more than ninety per cent of the trouble has been due to inferior workmanship.

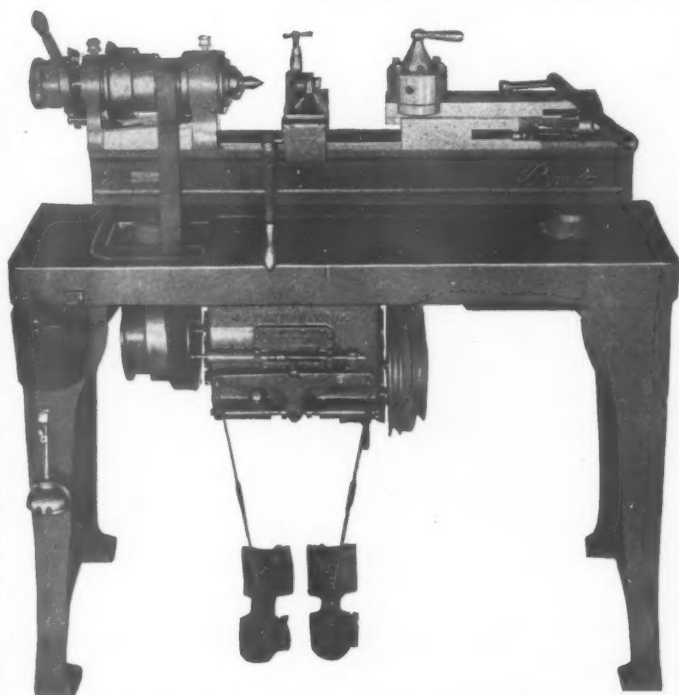
Instruments of the highest degree of precision must be obtained and used skillfully. It is not satisfactory to check alignment or level of shafts by the kind of level found in the average machinist's kit. It is desirable to use precision levels indicating to .0002" per foot. Dial gauges which will actually indicate .0001" have to be used. It is not sufficient to merely buy a ten-thousands dial gauge from a reputable maker, such a gauge must be carefully used and checked from time to time to make sure that it is really sensitive.

W

HEN DECEMBER ARRIVES most of us are inclined to look forward to the holiday period just ahead; but isn't it just as appropriate to look back at that time to see what the year has brought and in so doing place ourselves in a better position to appreciate what is to come? With the wheels of industry turning over at a good clip we like to look back at some good production record or job well done, but let's not overlook the skeleton in the closet—that job on which an outright blunder was made, the delivery (or deliveries) that were not kept, or perhaps it was just a case of not correctly interpreting a none too clear specification. Name them what you will, and though we are not prone to tell about them in public, we all have them, and let us be thankful that we do, because it proves that we are still just a bunch of normal human beings trying to get along. We are not all Charlie Gehringers or Joe Medwicks, but on the whole the old batting average is up there and the best of them strike out once in a while, so let's be willing to concede that one out doesn't retire the side, nor one error end the career of a fielder—it's the totals at the end of the year that count. Thanks for listenin'.

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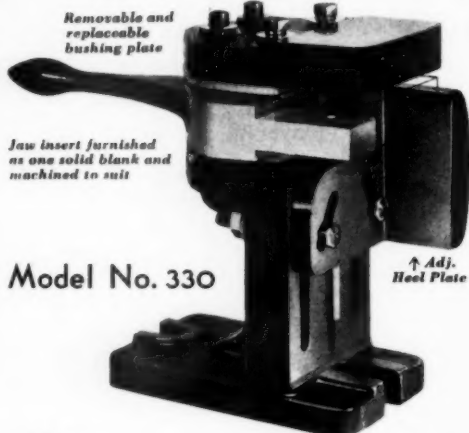
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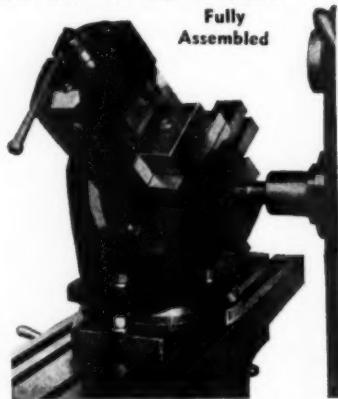
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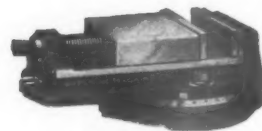
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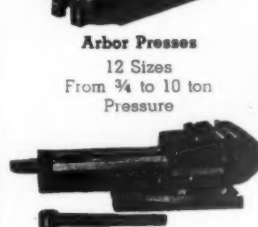
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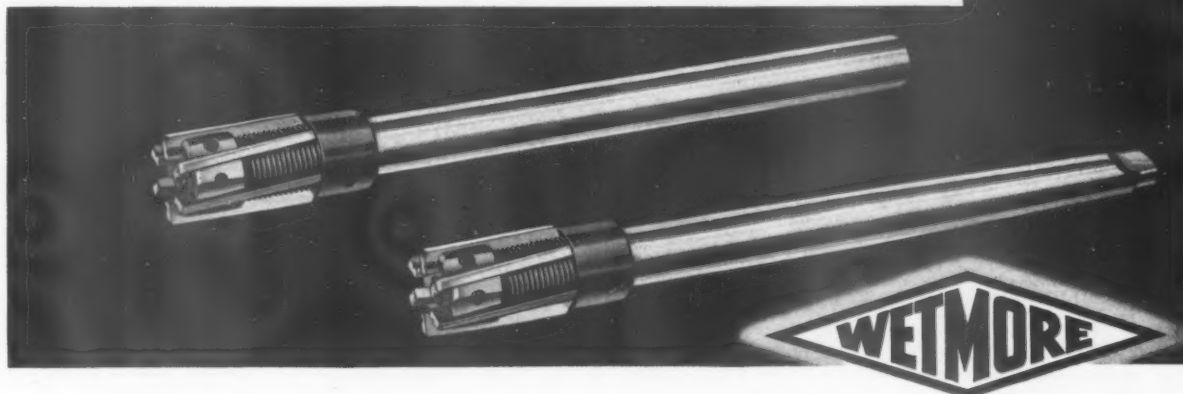
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UNBRAKO

Fig. 232

Fig. 1434
U.S. & Foreign
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Pat. Applied for

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UNBRAKO

Fig. 232—HOLLOW SET SCREW

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Fig. 1434—KNURLED SOCKET HEAD CAP SCREW

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Fig. 1564—SELF-LOCKING HOLLOW SET SCREW

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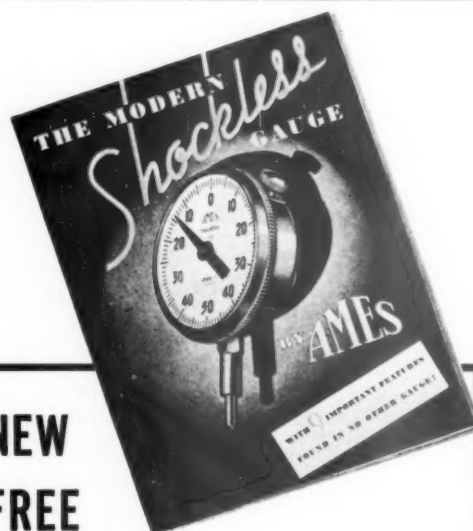
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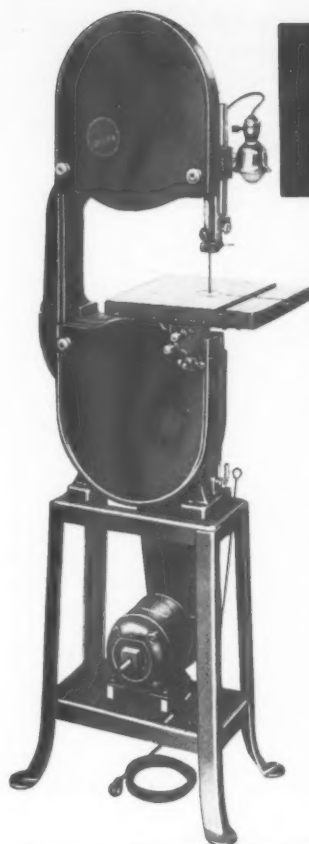
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6315



New Metal Cutting 14 inch BAND SAW

The regular 14-inch Delta band saw, fitted with countershaft to reduce the speed, has been used in hundreds of shops for cutting Iron, Steel, Brass, Bronze and Aluminum bars, shapes and sheets; in foundries for cutting off gates, in die-casting shops for trimming and sawing castings. Here is a new and improved back-gear model which is even more ideal for this work. It is the perfect machine for the general machine shop, toolroom or experimental shop, where many different materials must be cut.

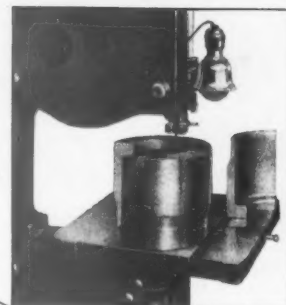
It takes the place of a power hacksaw in cutting off bars and shapes; it is used in the toolroom for sawing off tool, die and fixture stock; it will cut uniform strips from sheets; it saves hours of time in cutting templates and similar tools, and will cut almost any material, such as asbestos, mica, vulcanite, fiber, etc. . . . difficult to cut by ordinary means.

It will "double in wood," too, by a simple change of belts, as provision is made for four low metal-cutting speeds and one high speed for wood sawing. Write for special circular giving full details and specifications.

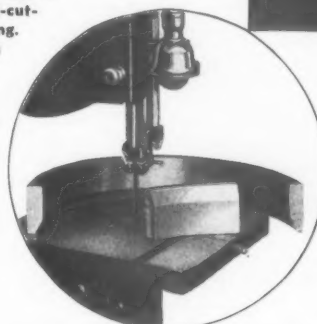
\$79.50 14" back-gear Metal-Cutting Band Saw, complete with guards, 8" arbor pulley for wood and cone pulley for metal. With one 14-tooth metal-cutting blade. Without light attachment, belts, stand, motor or motor-pulley. Shipping weight 175 lbs.

DELTA MFG. CO.

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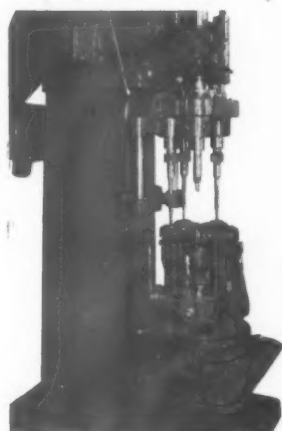


One of these draw-die segment rings was impractical to cut on the milling machine because of the diameter of cutter required; the other because the diameter of the ring was too large for the milling machine. Both, however, are cut with ease and speed on the Delta band saw. Try your next "awkward" job on one of these versatile tools.



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Ask for Catalog B-35

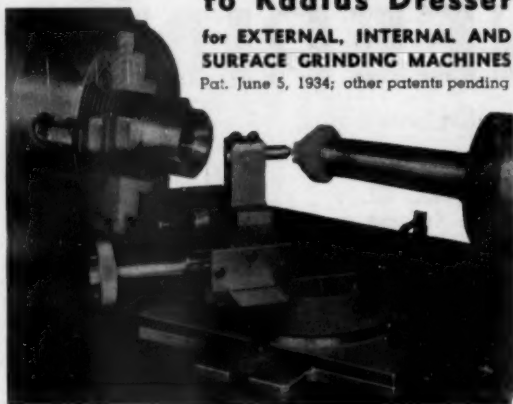
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for EXTERNAL, INTERNAL AND
SURFACE GRINDING MACHINES
Pat. June 5, 1934; other patents pending



The Vinco Dresser is universal in its application to grinding machines. The cut shows the dresser mounted on a No. 72 Heald Internal Grinder. With this installation you can dress angles and radii tangent on abrasive wheels. The bridge, sub-base and diamond holder are extra equipment. The Dresser is mounted on a sub-base with hardened and ground keys in its base. The keyway in the bridge positions the dresser parallel with the grinding spindle. An adjustable stop fitted to the keyway in the bridge permits the dresser to be set in the right relation to the grinding wheel. After dressing the desired form on the wheel remove the dresser from the bridge, then bring the wheel into position and grind. If the wheel wears out of form or glaze, place the dresser against stop and redress wheel. It is easy to dress wheels accurately the Vinco Way. The Vinco Dresser is a permanent precision-made tool with no time limit to its life. It saves 75% in dressing costs, and is guaranteed to give perfect satisfaction.

Send for Descriptive Circular.

VINCO TOOL CO., 7350 Central Ave., Detroit, Michigan

New Equipment

(Continued from Page 44)

In addition to its more obvious uses in many types of plants throughout the metallurgic industries where it is used both in receiving rooms to check deliveries of raw materials with specifications ordered and in routine production control, it also has a number of uses in plant maintenance work. Besides its use to test rail ends it was pointed out, for instance, that it is being used wherever an accurate knowledge of metal hardness is a factor in safety and continuous operation.

The outfit is composed of the Telebrineller instrument proper, a bar of known hardness, a microscope with a scale etched in its focal plane and a slide rule, packed with extra test bars and impression balls in a small case. The instrument itself consists of a metal tube supported in a soft rubber head (2) and a rubber spacing block (6), the tube holding the bar of known hardness (3). An anvil (1) in the top of the rubber head rests directly on the bar. Below the bar an impression ball (4), secured in a narrow aperture in the base of the head comes in direct contact with the metal to be tested. The spacing bar (7) holds the bar in a clear area for each test.

To make a test the instrument is held against the specimen and the anvil is struck a sharp blow with a 3 to 4 pound hammer. The impact is transmitted through the anvil to the bar, then to the ball and on to the specimen.

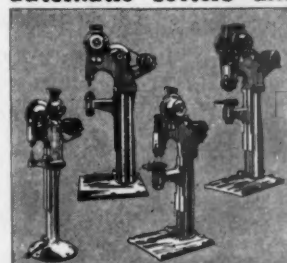
For new literature fully describing the Telebrineller and its use write Teleweld, Inc., Railway Exchange Bldg., Chicago, Ill. Mention "The Tool Engineer."

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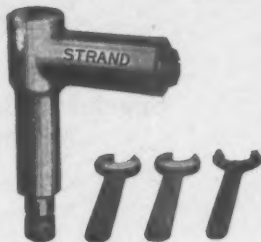
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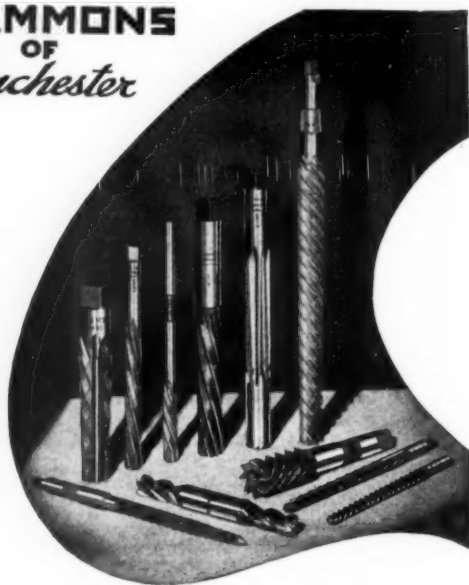
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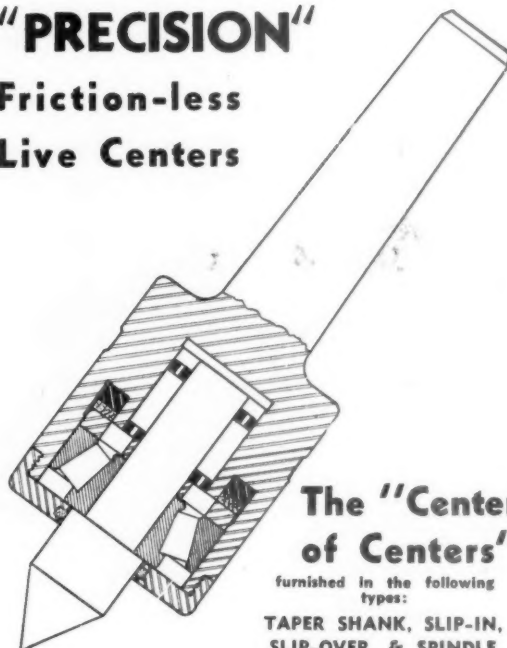
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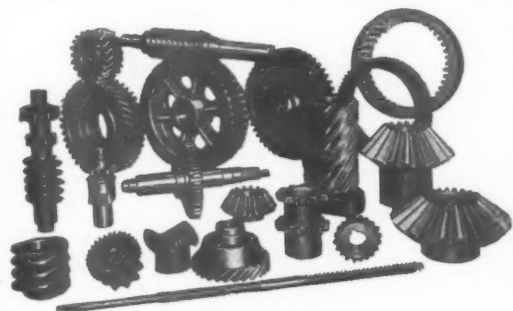
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2 $\frac{1}{2}$	$\frac{1}{2}$	1	6.60	3.30	5	$\frac{1}{2}$	1	21.30	10.65
2 $\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{4}$	6.60	3.30	5	1	1	21.30	10.65
3	$\frac{1}{8}$	1	6.50	3.25	6	$\frac{1}{8}$	1	9.00
3	$\frac{1}{4}$	1	6.50	3.25	6	$\frac{1}{4}$	1	9.00
3	$\frac{3}{8}$	1	6.90	3.45	6	$\frac{3}{8}$	1	9.00
3	$\frac{1}{2}$	1	7.20	3.60	6	$\frac{1}{2}$	1	9.00
3	$\frac{3}{4}$	1	7.60	3.80	6	$\frac{3}{4}$	1	19.70	9.85
3	1	1	8.00	4.00	6	1	1	21.80	10.90
4	$\frac{1}{8}$	1	9.00	4.50	6	$\frac{1}{2}$	$1\frac{1}{4}$	14.00
4	$\frac{1}{4}$	1	9.00	4.50	6	$\frac{3}{4}$	$1\frac{1}{4}$	21.80	10.90
4	$\frac{3}{8}$	1	10.10	5.05	6	1	$1\frac{1}{4}$	24.00	12.00
4	$\frac{1}{2}$	1	10.10	5.05	6	1	$1\frac{1}{2}$	24.00	12.00
4	$\frac{3}{4}$	1	12.30	6.15	6	1	$1\frac{1}{2}$	28.40	14.20
4	1	1	10.10	5.05	7	$\frac{1}{8}$	$1\text{ or }1\frac{1}{4}$	15.00
4	$\frac{1}{4}$	1	11.30	5.65	7	$\frac{1}{4}$	$1\text{ or }1\frac{1}{4}$	15.00
4	$\frac{3}{8}$	1	11.30	5.65	7	$\frac{3}{8}$	$1\frac{1}{4}$	34.40	17.20
4	$\frac{1}{2}$	1	12.30	6.15	7	1	$1\frac{1}{4}$	40.30	20.15
4	$\frac{3}{4}$	1	13.30	6.65	8	$\frac{1}{8}$	$1\text{ or }1\frac{1}{4}$	20.00
4	1	1	14.30	7.15	8	$\frac{1}{4}$	$1\text{ or }1\frac{1}{4}$	20.00
5	$\frac{1}{8}$	$1\frac{1}{4}$	5.00	8	$\frac{3}{8}$	$1\frac{1}{4}$	45.20	22.60
5	$\frac{1}{4}$	1	7.00	8	1	$1\frac{1}{4}$	53.40	26.70

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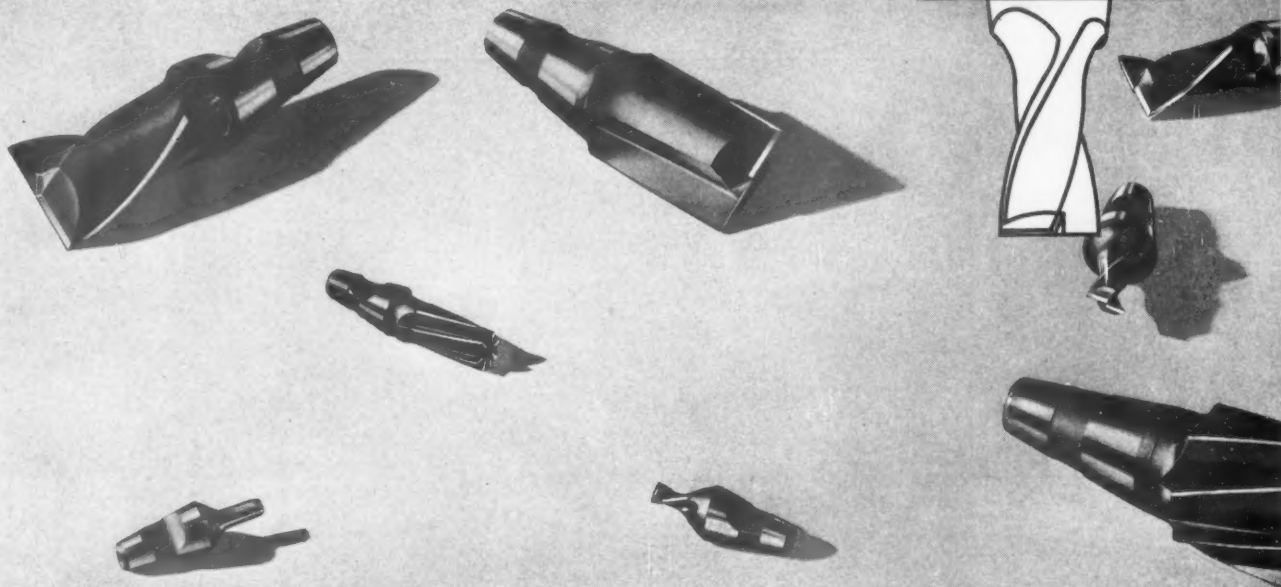
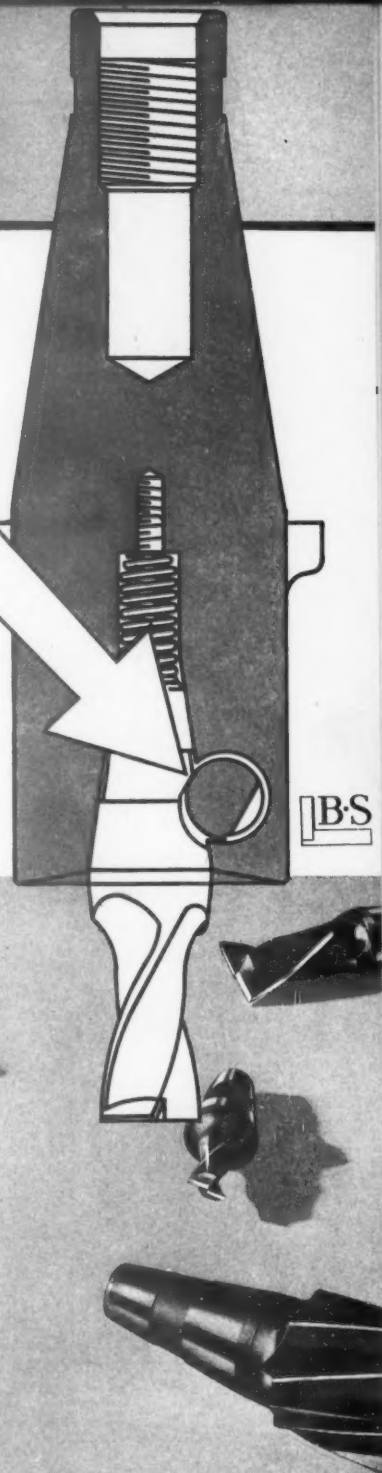
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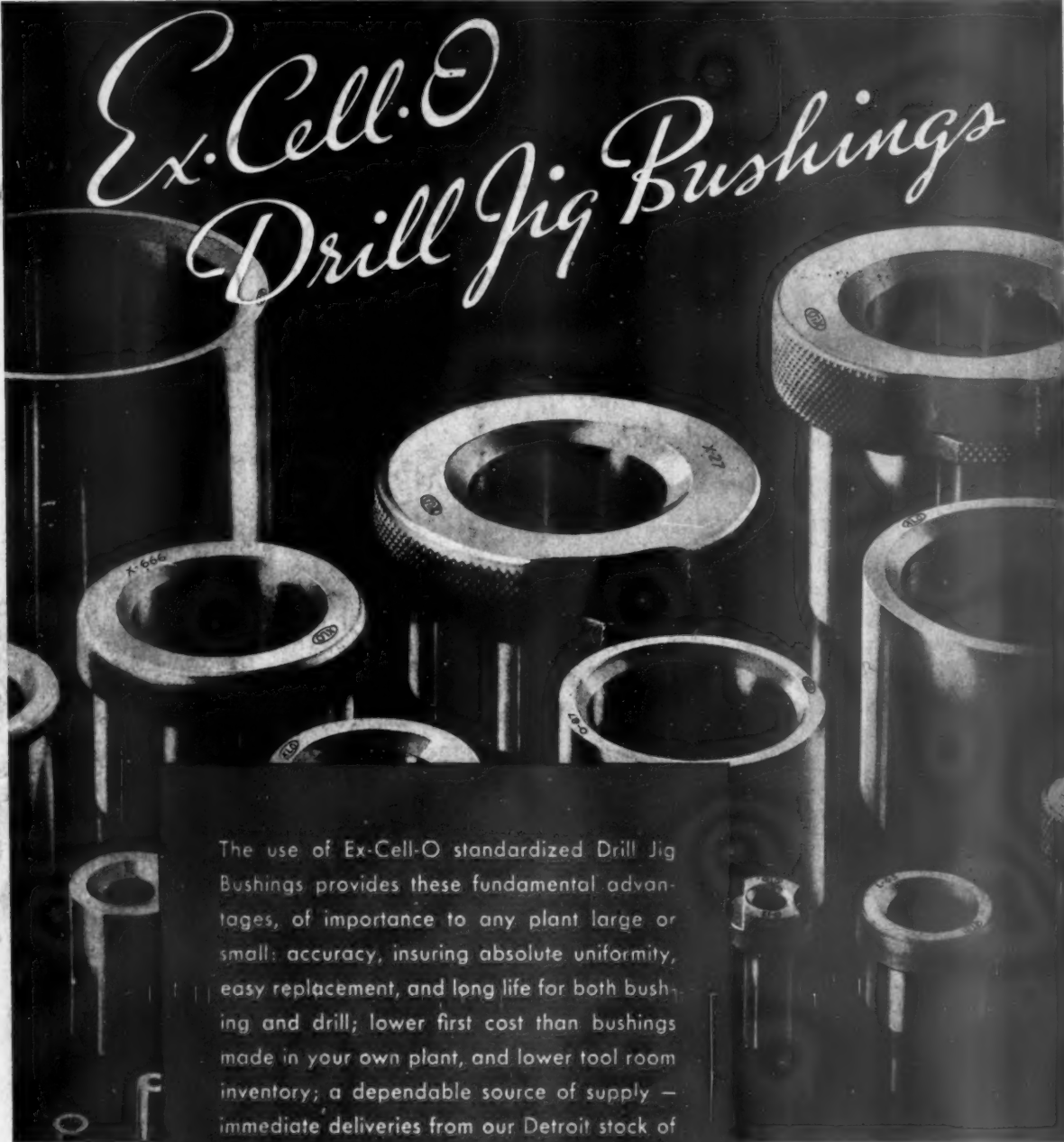
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